CHAPTER 2

ALTERNATIVES

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CHAPTER 2

ALTERNATIVES

Introduction

This chapter discusses the preferred and alternative actions that have been developed to treat vegetation using herbicides on public lands in the western U.S., including Alaska. The preferred and alternative actions are those that could be taken to feasibly attain, or approximate the BLM's objectives for vegetation management, as expressed in its programs, policies, and land use plans.

Alternatives were developed to respond to the various significant issues and alternative proposals raised during scoping, yet still meet the project's purpose and need described in Chapter 1. Alternatives were also developed to ensure BLM compliance with federal, tribal, state, and local regulations. This chapter also includes mitigation measures for the proposed action and alternatives.

As described in the *Scoping Comment Summary Report for the Vegetation Treatments Programmatic EIS* (ENSR 2002), alternative proposals generated during scoping primarily focused on the types of herbicides that would be used by the BLM, methods of application, and amounts of herbicides applied. To help the reader better understand the alternative proposals, this chapter 1) identifies BLM programs primarily responsible for treatment of vegetation using herbicides; 2) describes the types of planning and project implementation that must occur before herbicides can be used on public lands; and 3) lists the herbicides evaluated in the PEIS, their mode of action, and their methods of application. These sections are followed by a description of the five alternatives developed for this PEIS, and a summary of 1) standard operating procedures (SOPs) and special precautions that would apply under all alternatives, 2) additional protective (mitigation) measures developed during preparation of the PEIS, and 3) environmental and socioeconomic impacts that would result from implementation of the alternatives.

BLM Programs Responsible for Herbicide Treatments

In order to be effective, vegetation management by the BLM must involve all programs that rely on healthy plant species and communities to meet their objectives. The BLM's overarching goal for vegetation management is as follows:

> *Through an interdisciplinary collaborative process, plan and implement a set of actions that improve biological diversity and ecosystem function and which promote and maintain native plant communities that are resilient to disturbance and invasive species. Healthy functioning plant communities will enhance the ability to attain economic benefits on public lands* (USDI BLM 2006b).

If this goal is met, eventually the number of acres needing treatment should be reduced as a result of overall improvement in conditions. To achieve this goal, the BLM must 1) understand and plan for the condition and use of public lands, 2) focus on restoring sites that will most benefit from treatments, 3) select the appropriate treatments and SOPs to improve the likelihood of restoration success, 4) monitor treatments to better understand what treatments are successful or unsuccessful, and 5) convey information about treatment activities to BLM staff and the public.

Concurrently, public lands must be administered under the principles of multiple use and sustained yield in accordance with the intent of Congress as stated in the FLPMA. Thus, vegetation must be managed to protect and enhance the health of the land while providing a source of food, timber, and fiber for domestic needs (USDI BLM 2000c). Land-disturbing activities must be conducted in a manner that minimizes ecosystem fragmentation and degradation, and lands should be rehabilitated when necessary to safeguard the long-term diversity and integrity of the land.

Vegetation treatments using herbicides are primarily conducted by the Wildland Fire Management, Rangeland Management, Public Domain Forest

Management, Riparian Management, and Wildlife and Fisheries Management programs. Each program, as described below, has its own objectives for vegetation management, but still must meet the broad goal identified above. Types of herbicide treatments conducted by these programs include hazardous fuels reduction, weed control, fish and wildlife habitat improvement, habitat improvement for threatened and endangered species, and restoration of riparian habitats.

Wildland Fire Management

Efforts to reduce the risk of wildfire are primarily the responsibility of the Wildland Fire Management program. During fiscal year (FY) 2005, the Wildland Fire Management program conducted hazardous fuel treatments on about 542,000 acres in the WUI and nearly 727,000 acres in non-WUI areas. The program conducted Emergency Stabilization and Burned Area Rehabilitation activities on nearly 880,000 acres. Together, the USDI and Forest Service conducted over 3 million acres of hazardous fuels treatments and treated nearly 2.4 million acres in the WUI during FY 2005 (USDI BLM 2006c, d). Between 2001 and 2006, federal land management agencies invested more than 60% of fuels treatment dollars in the WUI, enabling collaborative treatment of some 8.5 million acres near communities (USDI BLM 2006c).

Prior to 1998, the BLM managed hazardous fuels on approximately 57,000 acres annually. Historically, approximately 70% of acres were managed to restore fire-adapted ecosystems, while the remaining 30% were managed to reduce wildfire risks to communities.

Under current direction, the number of acres treated annually by the BLM to reduce wildland fire risk would increase significantly, to about 3.5 million acres in the western U.S., including Alaska, and most treatments would occur in the WUI. Although all treatment methods would be used, prescribed fire and mechanical treatments would account for most fuels reduction in the continental U.S., and wildland fires for resource use would account for most fuels reduction in Alaska.

The Wildland Fire Management program is guided by the policies expressed in the following national policy documents: 1) *National Fire Plan* (USDI and USDA 2001a); 2) *Healthy Forests Initiative of 2002 and Healthy Forests Restoration Act of 2003* (Public Law 108-148); 3) Chapter 3 *(Interagency Burned Area Emergency Stabilization and Rehabilitation)* in BLM Manual 620 (*Wildland Fire Management*; USDI BLM 2004b); 4) *A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment 10-Year Comprehensive Strategy Implementation Plan* (USDI and USDA 2006a); 5) *Protecting People and Sustaining Resources in Fire Adapted Ecosystems: A Cohesive Strategy* (USDI and USDA 2006b); 6) *Draft Interagency Burned Area Emergency Response Guidebook* (USDI and USDA 2006c); 7) *Interagency Burned Area Rehabilitation Guidebook* (USDI and USDA 2006d); and 8) *Draft Burned Area Emergency Stabilization and Rehabilitation Handbook* (H-1742-1; USDI BLM 2006a).

Wildland Urban Interface (WUI)

The WUI has generally been defined by the National Wildfire Coordinating Group (NWCG) as "the line, area or zone, where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuel." A more specific definition is provided in the *Healthy Forests Restoration Act of 2003*:

1. An area within or adjacent to an at-risk community that is identified in recommendations to the Secretary of the Interior or Agriculture in a community wildfire protection plan (CWPP); or

2. In the case of an area for which a CWPP is not in effect:

   (a) an area extending ½ mile from the boundary of an at-risk community;

   (b) an area within 1½ miles from the boundary of an at-risk community, including any land that has a sustained steep slope that creates the potential for wildfire behavior endangering the at-risk community; has a geographic feature that aids in creating an effective fire break such as a road or ridge top; or is in Fire Regime Condition Class 3, as documented by the Secretary of the Interior in the project-specific environmental analysis; and

   (c) an area that is adjacent to an evacuation route for an at-risk community that the Secretary determines, in cooperation with the at-risk community, requires hazardous fuel reduction to provide safer evacuation from the at-risk community.

The variation in the WUI definition allows local issues to drive the definition, but makes national mapping of WUI difficult.

Rangeland Management

Approximately 165 million acres of public lands are upland rangeland, of which approximately 160 million acres are open to livestock grazing (USDI BLM 2006c). The Rangeland Management program in Alaska is responsible for reindeer grazing on approximately 5 million acres in western Alaska. The Rangeland Management program is responsible for upland health management, assessment, and restoration; rangeland improvement planning and implementation; allotment planning and administration; and resource monitoring. Management of rangeland ecosystems is conducted on a landscape basis through land use plans.

Vegetation treatment activities conducted by this program are designed to promote compliance with the state and regional rangeland health standards, but specific benefits of these projects often include livestock forage improvement, wildlife habitat improvement, suppression of plants that are toxic to wildlife and livestock, removal of plants that compete with more desirable vegetation, improvement of watershed conditions on rangelands, and restoration of native plant communities.

Vegetation treatments on public lands also include activities to control invasive species such as noxious weeds. The BLM uses an integrated pest management approach, more specifically integrated vegetation management. The goal of integrated vegetation management is to control invasive and unwanted vegetation, to prevent the spread of noxious weeds, to eradicate early-detected noxious weed species in areas where certain weeds have not yet become established, and to control weeds where they have become established. Vegetation control methods include physical and biological controls, and use of herbicides. The policy, direction, and requirements for planning and implementing integrated weed management are given in BLM Manual 9015, *Integrated Weed Management* (USDI BLM 1992b).

A total of 205,256 acres were treated to prevent the spread of noxious weeds and invasive plants in fiscal year (FY) 2005, and an estimated 317,959 acres were treated in FY 2004 by the Invasive and Noxious Weed program (USDI BLM 2006c). In addition, 3.9 million acres were inventoried for weeds during FY 2005.

Currently, the funding and labor resources available to combat weeds dictate a containment strategy. Actions will continue to be targeted at preventing the spread of weeds into the most vulnerable areas (USDI BLM 2000b).

Forest and Woodland Management

Approximately 26 percent (69 million acres) of the lands managed by BLM consist of forestlands and woodlands (USDI BLM 2006e). Of these lands, 57 million acres are classified as woodlands and 12 million acres are classified as forestlands. Two and one-half million acres are managed under the Oregon and California (O&C) Grant Lands program, while the remaining 66.6 million acres are managed under the Public Domain Forest Management program.

Woodlands are defined as land with 5% or more cover of low-stature tree species not typically used in commercial wood products, including land that formerly had such tree cover and will be naturally or artificially regenerated. Forestland is defined as land that has 10% or more cover of tall-stature tree species typically used in commercial wood products, including land that formerly had such tree cover and will be naturally or artificially regenerated.

Approximately 36.5 million acres of forestlands and woodlands are managed by the BLM in Alaska. These consist primarily of black spruce (14.7 million acres) and white spruce (17.2 million acres) woodlands. The remaining 4.6 million acres consist of many different forest types, including paper birch, aspen, balsam poplar, mountain hemlock and Sitka spruce.

Approximately 16 million of the 32 million acres of BLM forestlands and woodlands found in the remaining 16 western states consist of pinyon/juniper woodlands, where a mix of pinyon pine and juniper tree species predominates. Approximately 2.7 million acres are comprised of the Douglas-fir forest type, 1.9 million acres are the western juniper forest type, 1.1 million acres are the ponderosa pine forest type, and 0.3 million acres each are the lodgepole pine and aspen forest types. The remaining 10 million acres consist of a wide variety of forest and woodland types.

The Public Domain Forest Management and O&C Grant Lands programs are responsible for timber and non-timber special forest product sales, reforestation efforts, fish and wildlife habitat improvement, and forest vegetation composition and structure improvements intended to increase diversity and productivity of forest landscapes, as well as their resiliency in response to disease, insects, and wildfire.

The FLPMA and BLM Manual 5000-1, *Forest Management Public Domain* (USDI BLM 1991c), direct the policy of the Public Domain Forest Management program, including requirements for planning and implementing forestry and woodland management projects.

Management of the O&C Grant Lands program is authorized under *The Oregon and California Grant Lands Act of 1937* (43 U.S.C. 1181). The FLPMA applies to all public lands, including the O&C grant lands by definition (§103(e)). However, §701(b) of FLPMA (43 USC 170) provides that if any provision of FLPMA is in conflict with or inconsistent with the *Oregon and California Grant Lands Act* and *Coos Bay Wagon Road Act*, insofar as they relate to management of timber resources and disposition of revenue from lands and resources, the latter Acts will prevail.

Treatments that are addressed in this document include: 1) reducing plant competition to enhance the growth of desired tree species and structures, 2) managing forest stands to provide habitat for wildlife and prevent epidemic insect or disease outbreaks, and 3) managing vegetation that could serve as fuel for wildfires. In 2006, the program implemented forest restoration treatments on 31,948 acres and forest management treatments on 28,644 acres (USDI BLM 2006c). Sales of timber, wood products, and non-timber special forest products totaled nearly $36.1 million during FY 2005 (USDI BLM 2006d).

Riparian Management

The BLM manages over 23 million acres of riparian and wetland areas, comprising about 9% of public lands, and providing habitat for roughly 80% of the fish and wildlife species on public lands. The Riparian Management program's responsibilities include watershed, riparian, and wetland inventories, assessments, maintenance, restoration, and reconstruction. During 2005, the program assessed the condition of over 4,300 miles of streams, implemented enhancement projects on approximately 310 acres of wetlands and 542 miles of streams, and monitored over 8,200 acres of lakes and wetlands and 2,380 miles of streams (USDI BLM 2006c).

Wildlife, Fisheries, and Threatened and Endangered Species Management

The BLM manages nearly 261 million acres in the 17 western states, including some of the nation's most ecologically diverse wildlife habitat—more habitat than any other federal or state agency. BLM-administered land is important to big game, waterfowl, shorebirds, songbirds, raptors, and hundreds of species of non-game mammals, reptiles, and amphibians.

The BLM's Wildlife Management program provides support for land use planning and development of conservation plans for at-risk species, such as the mountain plover, greater and Gunnison sage-grouse, lesser prairie chickens, white-tailed, black-tailed and Gunnison's prairie dogs, and their habitats. BLM biologists work with partners in big game habitat restoration, including reestablishment of bighorn sheep into historically occupied habitats, restoration of mule deer winter ranges, and enhancement of summer ranges for elk. BLM biologists continue to monitor habitat conditions and populations of numerous species, including prairie dogs, amphibians, sage-grouse, burrowing and spotted owls, muskox, caribou, and moose populations. One of the Wildlife Management program's highest priorities is development and implementation of conservation plans for the greater and Gunnison's sage-grouse. The BLM manages over 30 million acres of sage-grouse habitat in an 11-state region.

The BLM Fisheries program oversees management that directly affects over 155,000 miles of fish-bearing streams and 4 million acres of lakes and reservoirs. Water bodies on BLM-administered lands are diverse, ranging from isolated desert springs harboring populations of rare and unique fishes, to large interior Columbia River tributaries supporting salmon and resident fishes of exceptional regional and national value. These waters also support subsistence fisheries that sustain Native American cultural heritages, as well as fisheries providing recreational opportunities for the growing human population of the western United States.

The BLM's Threatened and Endangered Species Management program is responsible for the management and recovery of federally-listed species, including plants, wildlife, and fish on public lands. In addition, the program is responsible for the management of sensitive plant species on public lands.

The Wildlife Management, Fisheries Management, and Threatened and Endangered Species Management programs support the Great Basin Restoration and the Conservation of Prairie Grasslands initiatives. In 2000, the BLM implemented the Great Basin Restoration Initiative, a regional restoration strategy to restore and enhance nearly 70 million acres of sagebrush habitat in Nevada, Utah, Oregon, and Idaho, and California. The focus of this effort is to prevent much of the land burned in wildfires from being overwhelmed by annual grasses and noxious weeds. The same year, the BLM also began the Conservation of Prairie Grasslands initiative to protect and maintain important grasslands on approximately 15 million acres of short- and mixed-grass prairie in a 7-state area that extends from Canada to Mexico. Both efforts focus on managing healthy landscapes and protecting and restoring habitats to benefit wildlife. The Wildlife Management and Fisheries Management programs are also responsible for managing subsistence uses on public lands in Alaska.

FLPMA and several manuals (BLM Manual 6500 - *Wildlife and Fisheries Management*; BLM Manual 6720 - *Aquatic Resource Management*; BLM Manual 6780 - *Habitat Conservation Management Planning*; and BLM Manual 6840 - *Special Status Species Management*) outline the policy, direction, and requirements for planning and implementing management and treatments for fish, wildlife, and special status species and their habitat.

Other Programs

Several other programs within the BLM also treat vegetation using herbicides, although to a lesser extent than the programs listed above (USDI BLM 2004a). These include the Cultural Resources, Recreation, Wilderness, Energy and Minerals, Transportation, and Realty and Ownership Management programs. Herbicides are used to manage vegetation on recreation and wilderness areas and on lands disturbed by energy and mineral development. The Realty and Ownership Management program issues ROW. Herbicides are often preferred for use on ROW over other treatment methods or in conjunction with other treatments because they are often most effective at controlling or removing vegetation before, or shortly after, it emerges. Other facilities requiring vegetation management include campgrounds, visitor centers, and other recreational facilities; administrative buildings; communications facilities; and roads. At these sites, vegetation management focuses on controlling vegetation that can pose a safety or fire hazard, or is not aesthetically pleasing The BLM uses premergence and postemergence herbicides to control emerging vegetation.

Vegetation Treatment Planning and Management

The BLM's *Strategic Plan* (USDI BLM 2000a); *A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment 10-Year Comprehensive Strategy Implementation Plan* (USDI and USDA 2002); *Partners Against Weeds: An Action Plan for the Bureau of Land Management* (USDI BLM 1996), and *Pulling Together: National Strategy for Invasive Plant Management* (USDI BLM 1998) identify broad objectives for management of vegetation on public land, while treatment activities at the local level are guided by the goals, standards, and objectives of land use plans developed for each BLM field office.

Although vegetation management actually occurs at the local level, policies established at the national level help direct local efforts. Examples of national policy direction designed to improve vegetation management efforts include development of rangeland health standards and development of assessments and evaluations for land, water, air, and vegetative health (USDI BLM 2002a). These assessments provide information that is used to ascertain achievement of land health standards and to identify causes for not meeting standards. These assessments are used to help identify restoration activities and establish restoration priorities.

Land Use Planning

Land use planning decisions are the basis for every on-the-ground action the BLM undertakes. Land use plans, usually in the form of RMPs, ensure that public lands are managed in accordance with the intent of Congress, as stated in FLPMA (43 USC 1701 et seq.), under the principles of multiple use and sustained yield. As required by FLPMA and BLM policy, "public lands must be managed in a manner that protects the quality of scientific, scenic, historical, ecological, environmental, air and atmospheric, water resource, and archaeological values; that, where appropriate, will preserve and protect certain public lands in their natural condition; that will provide food and habitat for fish, and wildlife and domestic animals; that will provide for outdoor recreation and human occupancy and use; and that recognizes the Nation's need for domestic sources of minerals, food, timber, and fiber from the public lands by encouraging collaboration and public participation throughout the planning process."

Land use plans guide land use and vegetation management decisions within the geographic area they cover, and provide specific goals, standards, objectives, and expected outcomes that apply to vegetation treatment projects and activities. These plans identify important local resources to be protected, identify historic, current, and future desired conditions for vegetation, and describe land use activities and levels that are appropriate to maintain healthy vegetation. Wise planning also considers the importance of other natural resources, such as water and soil, when developing vegetation restoration strategies. In addition, BLM land use plans identify transportation facilities, utility corridors, and other infrastructure development on public lands that is likely to receive some form of vegetation treatment.

To assist with vegetation management planning, key resource elements, such as plant community types, aquatic habitats, sensitive areas, and invasive species concentration areas, are inventoried and mapped regionally and district-wide. Inventories and maps allow field managers to identify areas of high ecological integrity; to ensure that there is suitable habitat for wide-ranging species; to identify areas where land uses may be incompatible with long-term ecosystem health; and to identify areas that could benefit from improved management. Inventories and mapping are also done at the local level to help managers better understand how proposed projects fit in with vegetative conditions on a larger scale, such as within ecoregions or watersheds. The BLM also cooperates with other agencies, organizations, and landowners in regional planning efforts, including establishment of Cooperative Weed Management Areas.

Site Selection and Treatment Priorities

Upon approval of a land use plan, subsequent implementation decisions are often put into effect by developing implementation plans. Implementation plans, also referred to as “activity plans,” tend to focus on multiple resources, and include vegetation treatment activities within a BLM field office jurisdiction. Implementation plans are made with the appropriate level of NEPA analysis; implementation decisions are usually made by BLM field managers. Implementation decisions identify site-specific vegetation management practices to achieve desired outcomes laid out in the land use plans. Some examples of practices include fuels treatments and integrated vegetation management techniques for weed infestations.

General Site Selection and Treatment Priorities

Several factors influence where treatments will occur and treatment priorities:

- Statutory mandates, including the FLPMA, ESA, HFRA, and Taylor Grazing Act.
- Program guidance including such initiatives as the Healthy Forests Initiative and the Great Basin Restoration Initiative.
- Goals of the Strategic and Annual Performance Plans.
- Existing risks to resources.
- Likelihood of success in restoring natural biotic communities.
- Cost-effectiveness of actions.

National priorities have been established for various BLM vegetation management programs. These priorities were developed for use in conjunction with state and local office priorities for meeting restoration goals, and address site-specific conditions and/or issues as laid out in the land use plan. For example, the following treatment priorities have been established to promote integrated efforts across BLM resource programs that manage vegetation:

- WUI community protection treatments that are designed to reduce the risk of wildfire to the community and/or its infrastructure developed collaboratively with the community.
- Treatments to restore or maintain healthy, diverse, resilient, and productive native plant communities.
- Special status species habitat improvement projects designed to improve or protect special status fish, wildlife, and plant habitat.
- Treatments that will be planned, implemented, and/or monitored using funding from multiple sources, both internal and external.
- Landscape treatments (>1,000 acres for mechanical and >4,500 acres for prescribed fires), coordinated across field office boundaries, to improve treatment effectiveness.
- Contracted treatments that support economic opportunities for rural communities and/or high potential to use stewardship contracting authorities.

- Treatments that have a high potential for woody biomass utilization.

Weed Treatment Site Selection and Treatment Priorities

For noxious weeds and invasive plants, vegetation treatment priorities identified in the *EIS Vegetation Treatment on BLM Lands in Thirteen Western States* (USDI BLM 1991a) are still applicable. They are:

- Take actions to prevent or minimize the need for vegetation controls, where feasible.
- Use effective nonchemical methods of vegetation control, where feasible.
- Use herbicides only after considering the effectiveness of all potential methods.

Development of a weed management strategy is set up at the local level and aligned with the land use planning objectives.

Actions to prevent or minimize the need for vegetation control can include protecting intact systems; maintaining conditions that have led to healthy lands (e.g., allowing natural fires to burn); reducing the impact of ongoing activities (e.g., improving grazing management practices); and applying mitigation measures to new projects to minimize soil and vegetation disturbance and avoid introductions of invasive species.

If treatment is required, efforts are focused on activities that restore natural ecosystem processes, and on ventures that are likely to succeed and provide the greatest benefits with the least expenditure of capital. Also beneficial to treatment success is site-specific analysis that includes 1) a determination of site potential under current circumstances, 2) an evaluation of land health based on land assessment studies, 3) an assessment of causes of land degradation, 4) an assessment of the likely effectiveness of treatment methods, and 5) an evaluation of the success of restoration efforts on similar types of land.

Several management objectives are considered when determining appropriate treatment of an infestation.

- Containment to prevent weed spread from moving beyond the current infestation perimeter;

- Control to reduce the extent and density of a target weed;

- Eradication to completely eliminate the weed species including reproductive propagules (this is usually only possible with small infestations); and

- Restoration of native plant communities and habitats using native species that are adapted to the project site to compete with invasives.

Several variables are considered when determining what, when, and how weed populations should be treated. These include, but are not limited to:

- The species – is it an aggressive non-native species that could be on a state noxious weed list or an adjacent state's noxious weed list, or that could be a species known for altering plant communities or ecological processes on a regional basis? If a species is native to a project area, how does current management influence the increase of the species beyond acceptable levels?

- Location – is the infestation found in a special management area, in a formerly uninfested area, or upslope/upstream from current treatments (i.e., could the species reinfest treated areas)? Does the infestation pressure or negatively impact special status plants or their habitats?

- Extent – is the infestation at a size where eradication is possible, in an area where other infestations are numerous, or of a size that may not be able to be eradicated, but can be contained or controlled to some extent? Is the extent of the infestation so large that one treatment would cover all of the known locations of an endemic species or its required resources?

The following suggests a decision process for prioritizing weed treatments in order to focus efforts towards success. It provides broad guidance to be adapted to the local level based on species, size, and extent of infestations. Priorities are then matched with the management objectives listed above.

1. Highest Priority: New aggressive infestations in an uninfested area or small infestations in areas of special

concern (e.g., wilderness, research natural areas). Management objective: Eradicate.

2. Higher Priority: Areas of high traffic or sources of infestation and larger infestations in areas of special concern. Management objective: Control.

3. High Priority: Existing large infestations or roadside infestations where spread can be checked or slowed. Management objective: Contain.

The overriding goal is to prioritize treatment methods based on their effectiveness and likelihood to have minimal impacts on the environment, and to restore desirable vegetation on lands where necessary (i.e., where desired vegetation cannot reestablish naturally).

Vegetation Treatment Methods

Although this PEIS focuses on BLM vegetation treatments using herbicides, such treatments are only a small part of a larger effort proposed by the BLM to treat vegetation on approximately 6 million acres each year. In addition to herbicides, the BLM uses fire and manual, mechanical, and biological control treatment methods. The use of these non-herbicide methods is discussed in more detail in the PER. As with herbicides, treatments using other methods can occur anywhere on public lands, although actual treatment methods, acres treated, and treatment locations are determined at the local field level and by Congressional direction and funding. Currently, the BLM is treating about 2 million acres annually using all methods.

Herbicides are chemicals that kill or injure plants. Herbicides can be categorized as selective or non-selective. Selective herbicides kill only a specific type of plant, such as broad-leaved plants, while non-selective herbicides kill all types of plants. The use of herbicides and modes of action are discussed in more detail below.

Fire use includes prescribed fire and wildland fire use for resource benefits. Prescribed fire is the intentional application of fire to wildland fuels under specified conditions of fuels, weather, and other variables. The intent is for the fire to stay within a predetermined area to achieve site-specific resource management objectives. Wildland fire use for resource benefit is a fire ignited by lightening but allowed to burn within specified conditions of fuels, weather, and topography, to achieve specific objectives

Mechanical treatment involves the use of vehicles such as wheeled tractors, crawler-type tractors, or specially designed vehicles with attached implements designed to cut, uproot, or chop existing vegetation. Mechanical methods that may be used by the BLM include chaining, root plowing, tilling and drill seeding, mowing, roller chopping and cutting, blading, grubbing, and feller-bunching.

Manual treatment involves the use of hand tools and hand-operated power tools to cut, clear, or prune herbaceous and woody species. Treatments include cutting undesired plants above the ground level; pulling, grubbing, or digging out root systems of undesired plants to prevent sprouting and regrowth; cutting at the ground level or removing competing plants around desired species; or placing mulch around desired vegetation to limit competitive growth (USDI BLM 1991a).

Biological control involves the intentional use of domestic animals, insects, nematodes, mites, or pathogens (agents such as bacteria or fungus that can cause diseases in plants) that weaken or destroy vegetation (USDI BLM 1991a, Bonneville Power Administration [BPA] 2000). Biological control is used to reduce the targeted weed population to an acceptable level by stressing target plants and reducing competition with the desired plant species.

Integrating Vegetation Treatments

The BLM treats vegetation using fire, mechanical and manual methods, biological treatments, and herbicides. In an integrated vegetation management program, each management option is considered, recognizing that no one management option is a stand-alone option and that each has its own strengths and weakness. Utilizing the strengths of each allows for a more effective and environmentally sound program. When the BLM plans vegetation control management projects, all control methods should be available for use, allowing the BLM to select the one method, or the combination of methods, that optimizes vegetation control with respect to environmental concerns, effectiveness, and cost of control.

No individual method will control undesirable vegetation in a single treatment; diligence and persistence will be required over a number of years to subdue vegetation such as weeds. The success of different treatment methods depends on the type of vegetation being controlled. It is important to think of these treatment methods as they relate to specific characteristics of weeds and other vegetation.

Vegetation Treatment Method Selection

Vegetation treatment methods are selected based on several parameters, which may include the following:

- Management program/objective for the site.
- Historic and current conditions.
- Opportunities to prevent future problems.
- Opportunities to conserve native and desirable vegetation.
- Effectiveness and cost of the treatment methods.
- Success of past restoration treatments or treatments conducted under similar conditions or recommendations by local experts.
- Characteristics of the target plant species, including size, distribution, density, life cycle, and life stage in which the plant is most susceptible to treatment.
- Non-target plant species that could be impacted by the treatment.
- Land use of the target area.
- Proximity to communities.
- Slope, accessibility, and soil characteristics of the treatment area.
- Weather conditions at the time of treatment, particularly wind speed and direction, precipitation prior to or likely to occur during or after application, and season.
- Proximity of the treatment area to sensitive areas, such as wetlands, streams, or habitat for plant or animal species of concern.
- Potential impacts to humans and fish and wildlife, including non-game species.
- Need for subsequent revegetation and/or restoration.

These parameters are considered before a treatment method is selected (USDI BLM 1991a). For most vegetation treatment projects, pretreatment surveys are conducted before selecting one or more treatment methods. These surveys involve the consideration of all feasible treatments, including their potential effectiveness based on previous experience, and best available science, impacts, and costs. Before vegetation treatment or ground disturbance occurs, the BLM consults specialists or databases for information on sensitive areas within the project area. The site may have to be surveyed for listed or proposed federal threatened or endangered species and for evidence of cultural or historic sites. In some cases, areas may receive one or more treatments in combination, such as prescribed burning followed by an herbicide application, and some areas may be treated using one or more treatment methods over several years.

Herbicide Active Ingredients Evaluated under the Proposed Alternatives

In previous EISs, a total of 25 herbicide active ingredients were reviewed, 22 were evaluated, and 20 were approved for use in one or more states (Tables 2-1 and 2-2). The decision to approve these herbicides for use on public lands was based on a detailed analysis of the risks to human health and non-target species from the use of these chemicals.

Since the majority of these assessments were completed in the late 1980s, a comprehensive literature review was conducted as part of this PEIS to determine whether there was any significant new information relevant to environmental concerns regarding the continued use of these herbicides (McMullin and Thomas 2000). Local BLM field offices were also consulted for information from field applications suggesting that any of these chemicals should be re-analyzed. If so, a new risk assessment for that active ingredient was completed as part of this PEIS in order to assess whether the BLM should continue its use.

Based on the literature review and information from the field, sulfometuron methyl (Oust®) was found to potentially have significant impacts on non-target vegetation when carried on soil to untreated areas, effects that were not evaluated earlier. Thus, the toxicity and environmental fate of sulfometuron methyl were analyzed in this PEIS. It was determined that the remaining 19 herbicides did not require further analysis for human health risks. However, the BLM determined that the level of analysis contained in the non-target species assessments for fish and wildlife for the

Herbicide Terminology

Active ingredient (a.i.) is the chemical or biological component that kills or controls the target pest.

Adjuvant(s) are chemicals that are added to the pesticide formulation to enhance the toxicity of the active ingredient or to make the active ingredient easier to handle.

Formulation is the commercial mixture of both active and inactive ingredients.

Herbicide is a chemical pesticide used to treat vegetation.

Herbicide resistance occurs when naturally occurring heritable characteristics allow individual weeds to survive and reproduce, producing a population, over time, in which the majority of the plants of the weed species have the resistant characteristics.

Other ingredient(s) are those ingredients that are added to the commercial product (formulation), but are not herbicidally active. In the past, these were referred to as inert ingredients.

previous EISs was inadequate to characterize the risks to species of concern, including anadromous fish.

Since the mid-1990s, the Forest Service conducted ecological risk assessments (ERAs) for nine herbicide active ingredients also used by the BLM: 2,4-D, clopyralid, dicamba, glyphosate, hexazinone, imazapyr, metsulfuron methyl, picloram, and triclopyr. In addition, the Forest Service prepared interactive spreadsheets that allowed the BLM to determine exposure concentrations for plants and animals under different application rates and exposure scenarios for these herbicides. The ERAs and spreadsheets are available on the Internet at the Forest Service Pesticide Management and Coordination website at http://www.fs.fed.us/foresthealth/pesticide/risk.shtml.

Information contained in the ERAs was used by the BLM to characterize risks to non-target species from the specific chemicals and is incorporated by reference into this PEIS.

The Forest Service did not conduct ERAs for bromacil, chlorsulfuron, diuron, and tebuthiuron. Thus, the BLM conducted new ERAs for these herbicides as part of this PEIS.

The remaining six active ingredients currently approved for use by the BLM—2,4-DP, asulam, atrazine, fosamine, mefluidide, and simazine—have not been used, or their use has been limited to a very small number of acres, by the BLM for several years, primarily due to the availability of other, more effective approved active ingredients.

The BLM proposes to use four new herbicide active ingredients that are registered and available for use—diflufenzopyr (as a formulation with dicamba), diquat, fluridone, and imazapic. All four of the herbicides have been deemed effective in controlling vegetation, have minimal effects on the environment and human health if used properly, and are registered (except diflufenzopyr as a stand-alone active ingredient) with the USEPA. Diflufenzopyr is approved as a formulation with dicamba and is labeled as Distinct® and Overdrive®, but cannot be used as a stand-alone active ingredient by the BLM until it is registered with the USEPA.

The new active ingredients were selected based on: 1) input from BLM field offices on types of vegetation needing control; 2) studies indicating that these active ingredients would be more effective in controlling noxious weeds and other unwanted vegetation targeted for control than active ingredients currently used by the BLM; 3) USEPA approval for use on rangelands, forestlands, and/or aquatic environments (see http://cfpub.epa.gov/oppref/rereg/status.cfm?show=rereg for information on herbicide registration and fact sheets on all registered products); 4) responses from herbicide manufacturers to a request from the BLM in October 2001 for a list of herbicides not currently approved for use on public lands that may be appropriate to control vegetation; 5) the ability of the herbicide formulations to be applied on a variety of plant species needing control; 6) the level of risk of the herbicidal formulations to human health and the environment; and 7) the funds available to the BLM to conduct human health and ecological risk assessments of the proposed herbicides.

Diflufenzopyr, which is used in combination with dicamba for weed control, inhibits the transport of auxin in the plant. The result is an abnormal accumulation of auxin or auxin-like compounds in the growing points of susceptible plants and an imbalance in growth hormones in the plant. The combination of diflufenzopyr and dicamba is registered for use in all 17 western states except Alaska and California.

Diquat is a post-emergence, nonselective herbicide that can be applied directly to vegetation or to ponds, lakes, or drainage ditches for the management of aquatic weed species. Diquat is a cell membrane disrupter, whose

TABLE 2-1
Herbicide Active Ingredients Proposed, Evaluated, and included in Current Environmental Impact Statements of the Bureau of Land Management

Active Ingredient	EIS in Which Herbicide Evaluated				Summary of Evaluations for all EISs		
	Northwest Area Noxious Weed Control Program (1985)	California Vegetation Management (1988)	Vegetation Treatment on BLM Lands in 13 Western States (1991)	Western Oregon Program – Management of Competing Vegetation (1992)	Active Ingredients Considered	Active Ingredients Evaluated	Active Ingredients Approved for Use
2,4-D	Yes (Esteron-99; DMA-4)	Yes	Yes	Yes	Yes	Yes	Yes
2,4-DP		Yes			Yes	Yes	Yes
Ammonium sulfamate				Proposed, not evaluated	Yes	No	No
Amitrole		Yes	Evaluated, but not included		Yes	Yes	No
Asulam		Yes		Yes	Yes	Yes	Yes
Atrazine		Yes	Yes	Yes	Yes	Yes	Yes
Bromacil		Yes	Yes		Yes	Yes	Yes
Chlorsulfuron			Yes		Yes	Yes	Yes
Clopyralid			Yes		Yes	Yes	Yes
Dalapon		Yes	Evaluated, but not included	Proposed, but not evaluated	Yes	Yes	No
Dicamba	Yes (Banvel)	Yes	Yes	Yes	Yes	Yes	Yes
Diquat				Proposed, but not evaluated	Yes	No	No
Diuron		Yes	Yes	Proposed, but not evaluated	Yes	Yes	Yes
Fosamine		Yes		Proposed, but not evaluated	Yes	Yes	Yes
Glyphosate	Yes (Rodeo)	Yes	Yes	Yes	Yes	Yes	Yes
Hexazinone		Yes	Yes	Yes	Yes	Yes	Yes
Imazapyr			Yes		Yes	Yes	Yes
Mefluidide			Yes		Yes	Yes	Yes
Metsulfuron methyl			Yes		Yes	Yes	Yes
Monosodium methanearsonate				Proposed, but not evaluated	Yes	No	No
Picloram	Yes (Tordon 2K, Tordon 22K)	Yes	Yes	Yes	Yes	Yes	Yes
Simazine		Yes	Yes		Yes	Yes	Yes
Sulfometuron methyl			Yes		Yes	Yes	Yes
Tebuthiuron		Yes	Yes		Yes	Yes	Yes
Triclopyr		Yes	Yes	Yes	Yes	Yes	Yes
Active Ingredients Evaluated or Available for Use	4	16	17	8	25	22	20

TABLE 2-2
States in which Herbicides are Approved for Use on Public Lands Based upon Current Environmental Impact Statements, Court Injunctions, and Changes in Registration Status [1]

Chemical	AZ	CA	CO	ID	MT	NV	NM	ND	OK	OR East	OR West	SD	UT	WA	WY
2,4-D	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
2,4-DP		●													
Asulam		⦿									○				
Atrazine	●	●	●	●	●	●	●	●	●	○	○	●	●	●	●
Bromacil	●	●	●	●	●	●	●	●	●	○		●	●	●	●
Chlorsulfuron	●		●	●	●	●	●	●	●	○		●	●	●	●
Clopyralid	●		●	●	●	●	●	●	●	○		●	●	●	●
Dicamba	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Diuron	●	●	●	●	●	●	●	●	●	○		●	●	●	●
Fosamine		●													
Glyphosate	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Hexazinone	●	●	●	●	●	●	●	●	●	○	○	●	●	●	●
Imazapyr	●		●	●	●	●	●	●	●	○		●	●	●	●
Mefluidide	●		●	●	●	●	●	●	●	○		●	●	●	●
Metsulfuron methyl	●		●	●	●	●	●	●	●	○		●	●	●	●
Picloram	●	⦿	●	●	●	●	●	●	●	●	●	●	●	●	●
Simazine	●	●	●	●	●	●	●	●	●	○		●	●	●	●
Sulfometuron methyl	●		●	●	●	●	●	●	●	○		●	●	●	●
Tebuthiuron	●	●	●	●	●	●	●	●	●	○		●	●	●	●
Triclopyr	●	●	●	●	●	●	●	●	●	○	○	●	●	●	●

[1] These chemicals have not been approved for use in Alaska, Nebraska, and Texas.
● Based upon the current EISs, these herbicides have been analyzed and approved for application on BLM lands.
○ Based upon the current EISs, these herbicides have been analyzed and approved for application on BLM lands, but are not currently approved for use in Oregon per court injunction (Southern Oregon Citizens Against Toxic Sprays (SOCATS) v. Watt, No. 79-1098 (District Court of Oregon. October 20, 1982), 13 Environmental Law Report 20, 176.
⦿ Based upon the current EISs, these herbicides have been analyzed and approved for application on BLM lands, but application is not allowed due to change in registration status in the state.

mode of action is to intercept electrons from photosynthesis and transfer the energy from photosynthesis to various free radicals that damage cell membranes. Diquat is registered for use in all 17 western states.

Fluridone is a systemic, selective, aquatic herbicide that can be applied to the water surface or subsurface, or as a bottom application just above the floor of the water body. Fluridone is absorbed from the water by the plant shoots and taken up from the soil by the roots. In susceptible plants, fluridone inhibits the formation of carotene, which is essential in maintaining the integrity of chlorophyll. Fluridone is registered for use in all 17 western states.

Imazapic, a selective, systemic herbicide, can be applied both pre-emergence and post-emergence for the management of selective broadleaf and grassy plant species. Its mode of action is associated with the synthesis of branch-chained amino acids. Imazapic is registered for use in all 17 western states except Alaska and California.

In order to ensure that the use of these active ingredients is appropriate for public lands, the BLM conducted human health risk assessments (HHRAs) and ERAs to assess the potential for risks to humans and non-target plants and animals, including special status species, from using these active ingredients. An analysis of: 1) the toxicity and environmental fate of each active ingredient, and for a formulation of diflufenzopyr and dicamba (Overdrive®); 2) risks associated with surfactants found in herbicide formulations and herbicide active ingredient degradates; and 3) potential for herbicides considered in the PEIS to be endocrine disrupting chemicals, are provided in Chapter 4, Environmental Consequences, and in appendixes B, C, and D.

For new and currently available herbicides that may be proposed for use in the future, the BLM would follow the following steps for conducting risk assessments used in this PEIS: 1) assess a product's or a technology's effectiveness for use on target vegetation on public lands; 2) identify the level of data and analysis needed to conduct a human health and ecological risk assessment for that chemical; 3) determine the level of NEPA documentation required to support a decision to use a new product or technology; and 4) consult with the ESA regulatory agencies. These steps are discussed in more detail in Appendix E.

Herbicide Modes of Action and Treatment Methods

Herbicides are chemicals that kill or injure plants. Some herbicides are derived from plants, while others are manufactured synthetically. Herbicides can be classified by their mode of action, and include growth regulators, amino acid inhibitors, grass meristem destroyers, cell membrane destroyers, root and shoot inhibitors, and amino acid derivatives, which interfere with plant metabolism in a variety of ways (Table 2-3; Bussan and Dyer 1999).

Herbicides can be categorized as selective or non-selective. Selective herbicides kill only a specific type of plant, such as broad-leaved plants. Many herbicides used for vegetation management are selective for broadleaved plants, so that they can be used to manage such species while maintaining the desirable grass species in rangeland communities. Glyphosate is non-selective, so it must be used carefully around desirable and non-target plants (Rees et al. 1996).

Herbicides are most effective on pure stands of a single weed where desirable and non-target plants are scarce or absent (Colorado Natural Areas Program 2000). Herbicides are also effective for rhizomatous weed species that are unpalatable to livestock, require repeated cutting or pulling for control, or are located in remote areas where pulling and cutting are not feasible. Herbicides often work well in combination with other control treatments. For example, tamarisk, Russian olive, and Siberian elm can be controlled by cutting stems close to the ground in the fall and then spraying or painting the stems with an herbicide registered for that use.

Herbicide treatments would follow BLM procedures outlined in BLM Handbook H-9011-1 (*Chemical Pest Control*), and manuals 1112 (*Safety*), 9011 (*Chemical Pest Control*), and 9015 (*Integrated Weed Management)*, and would meet or exceed states' label standards (USDI BLM 1991a). Several herbicide application methods are available. The application method chosen depends upon the treatment objective (removal or reduction); accessibility, topography, and size of the treatment area; characteristics of the target species and the desired vegetation; location of sensitive areas and potential environmental impacts in the immediate vicinity; anticipated costs; equipment limitations; and meteorological and vegetative conditions of the treatment area at the time of treatment.

Herbicide application schedules are designed to minimize potential impacts to non-target plants and animals, while remaining consistent with the objective of the vegetation treatment program. The application rates depend upon the target species, the presence and condition of non-target vegetation, soil type, depth to the water table, presence of other water sources, and the label requirements.

Herbicides can be applied aerially with helicopters or fixed-wing aircraft, or on the ground with vehicles or manual application devices. Operation of helicopters is more expensive than operation of fixed-wing aircraft, but helicopters are more maneuverable and more effective in areas with irregular terrain. Helicopters also are more effective for treating target vegetation in areas with multiple vegetation types.

Two or more herbicides may be applied at the same time in a tank mix, when tank mixtures are specified on at least one of the labels for the chemicals used in the mix. Approximately 25% of herbicide applications on public lands involved tank mixes during 2002-2005.

Manual applications of herbicides are used only in small areas, in areas inaccessible by vehicle, and in areas where weeds are scattered. They are sometimes considered when special status plants are known or suspected in all or a portion of a project area. Herbicides may be applied with a backpack applicator or spray bottle, wick (wiped on), or wand (sprayed on). Herbicides can be applied to trees around the circumference of the trunk on the intact bark (basal bark), to cuts in the trunk or stem (frill, or “hack and squirt”), to cut stems and stumps (cut stump), or injected into the inner bark (Tu et al. 2001).

Herbicides can be used selectively to control specific types of vegetation, or non-selectively to clear all vegetation on a particular area. Herbicides can be applied over large areas and/or in remote locations using aircraft, or applied using spot applications in smaller, easily accessible locations.

There are several drawbacks and limitations to herbicide use. Herbicides can damage or kill non-target plants. Herbicides can be toxic or cause health problems in humans, other animals, and other plants. Herbicides must be applied by someone with the appropriate certification identified in state laws and BLM policy (Colorado Natural Areas Program 2000).

Herbicides would be applied according to the current label directions. The BLM would comply with changes in label directions that may occur in the future, and would comply with state registration requirements. Thus, if current state requirements do not allow the application of an herbicide approved for use in the PEIS, the BLM would not apply that herbicide in the state where it is not approved for use.

Weed populations may develop a resistance to a particular herbicide over time. Herbicide resistance is the inherited ability of a plant to survive an herbicide application to which the wild-type was susceptible. Resistant plants occur naturally within a population and differ slightly in genetic makeup, but remain reproductively compatible with the wild-type. Herbicide resistant plants are present in a population in extremely small numbers. The repeated use of one herbicide allows these few plants to survive and reproduce. The number of resistant plants then increases in the population until the herbicide no longer effectively controls the weed. Herbicide resistance is not the natural tolerance that some species have to an herbicide. The appearance of herbicide-resistant weeds is strongly linked to repeated use of the same herbicide or herbicides with the same site of action in a monoculture cropping system or in non-crop areas.

There are several things that can be done, and are being done by the BLM, to minimize the potential development of resistant weed species, including, but not limited to the following:

- Rotate herbicides – by understanding the different modes of action of each herbicide proposed for use on public lands, select the appropriate one to minimize resistance;
- Understand the potential effects of long-term residual herbicides on the selection for resistant weeds, and correctly apply these herbicides with the understanding that they can lead to weed resistance if used yearly for several consecutive years;
- Use mechanical and biological management options to eliminate weed escapes that may represent the resistant population; and
- Keep accurate records of herbicide application.

Description of the Alternatives

Five program alternatives were developed for and evaluated in this PEIS, including the Preferred Alternative and the No Action Alternative. Alternative actions are those that could be taken to feasibly attain, or approximate the BLM’s objectives for herbicide use, as expressed in its programs, policies, and land use plans.

Alternatives were developed that 1) allow the BLM to continue its current use of 20 active ingredients in 14 western states, as authorized by earlier EIS RODs; 2) allow for the use of 14 active ingredients currently used by the BLM and four new active ingredients; 3) prohibit the use of herbicides; 4) prohibit the aerial application of herbicides; or 5) prohibit the use of sulfonylurea and other acetolactate synthase-inhibiting active ingredients. These program alternatives address many of the concerns raised during scoping, in particular the public’s desire to see alternatives that place less emphasis on the use of herbicides, while still meeting the program’s purpose and need. Alternatives were also developed to ensure that the BLM complied with federal, tribal, state, and local regulations.

Alternative A – Continue Present Herbicide Use (No Action Alternative)

Under this alternative, the BLM would be able to continue to use 20 active ingredients approved for use in western states under the earlier EIS RODs for each state (Table 2-1; USDI BLM 1987a, 1988b, 1991b, 1992a). The BLM would also continue its activities conducted under Emergency Stabilization and Burned Area Rehabilitation and hazardous fuel reduction that are

TABLE 2-3
Herbicides Approved and Proposed for Use on Public Lands

Herbicide	Herbicide Characteristics and Target Vegetation	Areas Where Registered Use is Appropriate					
		Rangeland	Forestland	Riparian and Aquatic	Oil, Gas, and Minerals	ROW	Recreation and Cultural Resources
	Herbicides Approved for Use on Public Lands						
2, 4-D	Selective; foliar absorbed; postemergent; annual/perennial broadleaf weeds. Key species treated include burningbush, mustard species, and Russian thistle.	•	•	•	•	•	•
2, 4-DP	Selective; foliar absorbed; postemergent; broadleaf weeds and woody species. Key species treated include burningbush, mustard species, Russian thistle, and brush species.	•	•		•	•	•
Asulam	Inhibits mitosis; controls growing grasses and certain broadleaf weeds. Key species treated include brackenfern, dock, and Johnsongrass.				•	•	
Atrazine	Selective; mostly root absorbed; inhibits photosynthesis. Key species treated include annual grasses, mustards, pigweed, and Russian thistle.		•			•	
Bromacil	Non-selective; inhibits photosynthesis; controls wide range of weeds and brush. Key species treated include annual grasses and broadleaf weeds, burningbush, and Russian thistle.				•	•	•
Chlorsulfuron	Selective; inhibits enzyme activity; broadleaf weeds and grasses. Key species treated include biennial thistles and annual and perennial mustards.	•			•	•	•
Clopyralid	Selective; mimics plant hormones; annual and perennial broadleaf weeds. Key species treated include knapweeds, mesquite, and starthistle and other thistles.	•	•		•	•	•
Dicamba	Growth regulator; annual and perennial broadleaf weeds, brush, and trees. Key species treated include knapweeds, burningbush, and Russian and other thistles.	•			•	•	•
Diuron	Preemergent control; annual and perennial broadleaf weeds and grasses. Key species treated include annual grasses and broadleaf weeds, burningbush, and Russian thistle.				•	•	•
Fosamine ammonium	Inhibits bud and leaf formation; broadleaf weeds, brush, and trees. Key species treated include field bindweed, leafy spurge, and locust.				•	•	•
Glyphosate	Non-selective; annual and perennial grasses and broadleaf weeds, sedges, shrubs, and trees. Key species treated include annual, biennial, and perennial grasses and broadleaf weeds and woody shrubs.	•	•	•	•	•	•
Hexazinone	Foliar or soil applied; inhibits photosynthesis; annual and perennial grasses and broadleaf weeds, brush, and trees. Key species treated include mesquite and scrub oak.	•	•		•	•	•
Imazapyr	Non-selective; preemergent and postemergent uses; absorbed through foliage and roots; annual and perennial broadleaf weeds, brush, and trees. Key species treated include saltcedar.	•	•	•	•	•	•
Mefluidide	Growth inhibitor; suppresses seed production of grasses, brush, and trees. Key species treated include roadside grasses.				•	•	•
Metsulfuron methyl	Selective; postemergent; inhibits cell division in roots and shoots; annual and perennial broadleaf weeds, brush, and trees. Key species treated include annual and perennial mustards and biennial thistles.	•	•		•	•	•
Picloram	Selective; foliar and root absorption; mimics plant hormones; certain annual and perennial broadleaf weeds, vines, and shrubs. Key species treated include knapweeds, leafy spurge, and starthistle.	•	•		•	•	•
Simazine	Used selectively or as complete vegetation killer; requires much moisture for activation; inhibits photosynthesis. Key species treated include annual grasses, mustards, pigweed, and Russian thistle.				•	•	•

TABLE 2-3 (Cont.)
Herbicides Approved and Proposed for Use on Public Lands

Herbicide	Herbicide Characteristics	Areas Where Registered Use is Appropriate					
		Rangeland	Forestland	Riparian and Aquatic	Oil, Gas, and Minerals	ROW	Recreation and Cultural Resources
Herbicides Approved for Use on Public Lands (Cont.)							
Sulfometuron methyl	Broad-spectrum pre and postemergent control; inhibits cell division; grasses and broadleaf weeds. Key species treated include downy brome, annual and perennial mustards, and medusahead.		●		●	●	●
Tebuthiuron	Relatively non-selective soil activated herbicide; pre and postemergent control of annual and perennial grasses, broadleaf weeds, and shrubs. Key species treated include creosotebush, oak, Russian olive, and sagebrush (thinning).	●			●	●	●
Triclopyr	Growth regulator; broadleaf weeds and woody plants. Key species treated include mesquite and saltcedar.	●	●	●	●	●	●
Herbicides Proposed for Use on Public Lands							
Diflufenzopyr + Dicamba	Postemergent; inhibits auxin transport; broadleaf weeds. Key species treated include knapweeds, burningbush, and Russian thistle and other thistles.	●			●	●	●
Diquat	Non-selective and foliar applied. Key species treated include giant salvinia,water-thyme, and watermilfoils.			●	◘	◘	◘
Fluridone	Aquatic herbicide to control submersed aquatic plants. Key species treated include water-thyme and watermilfoils.			●			
Imazapic	Selective postemergent herbicide; inhibits broadleaf weeds and some grasses. Key species treated include downy brome, leafy spurge, medusahead, and mustards.	●	●		●	●	●

● = Areas where USEPA approved registration exists and the BLM has approval or proposes to use on public lands; ◘ = Areas where USEPA approved registration exists, but where the BLM does not propose to use on public lands.

evaluated by NEPA compliance documents prepared by local BLM field offices.

During 1999 through 2005, approximately two-thirds of acres were treated with just three active ingredients: picloram, tebuthiuron, and 2,4-D, and the majority of treatments were in Idaho, Montana, and Utah (Tables 2-4 and 2-5 and Figure 2-1). During that period, the BLM did not report any use of 2,4-DP, asulam, atrazine, mefluidide, or simazine, and treated less than 50 acres annually using fosamine. It is unlikely that the BLM would use these herbicides in the future since there are more suitable active ingredients available and approved for use to meet current needs.

Under this alternative, an estimated 305,000 acres would be treated annually using herbicides (Table 2-6), an increase over the number of acres that have been treated in recent years (Figure 2-1). Estimates of the number of acres that would be treated under the No Action Alternative were developed based on information provided by BLM field offices throughout the western U.S., including Alaska, during summer 2002.

TABLE 2-4
Average Number of Acres Treated Annually for Each BLM State Jurisdiction during 1997-2005.

State	Acres Treated Annually	Percentage of all Public Lands Treated
Arizona	7,664	6.3
California	2,676	2.2
Colorado	5,480	4.0
Idaho	30,572	25.0
Montana, North Dakota, and South Dakota	7,739	6.3
Nevada	4,820	3.9
New Mexico, Oklahoma, and Texas	42,570	34.8
Oregon and Washington	3,543	2.9
Utah	11,175	9.1
Wyoming and Nebraska	6,667	5.5

In developing acreage estimates for all alternatives, it was assumed that if an acre was treated more than once using the same type of treatment during the same year, it would be counted once. If the acre was treated using two or more different methods during the same year (for example, fire use followed by herbicide treatment), each treatment would count as one acre. Thus, if an acre was treated using fire and herbicides during the same year, two acres would be counted as treated. If an acre was treated using two or more herbicides in a tank mix, it would be counted once.

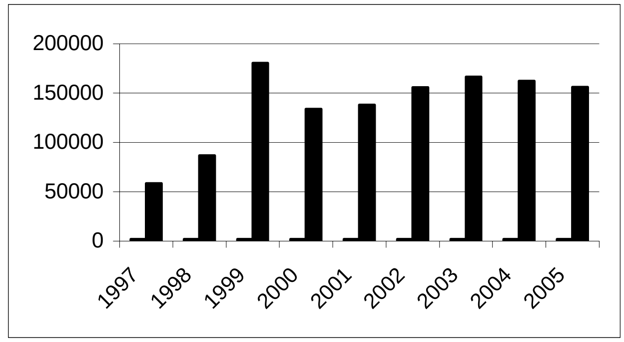

Figure 2-1. Summary of Acres Treated Using Herbicides during 1997-2005.

Alternative B – Expand Herbicide Use and Allow for Use of New Herbicides in 17 Western States (Preferred Alternative)

This alternative represents the treatment of vegetation using herbicides in 17 western states (including Alaska). Under the Preferred Alternative, approximately 932,000 acres would be treated annually using herbicides, based on the herbicide use projections developed by BLM field offices and funding projections for BLM vegetation treatment activities during the next decade. Based on field office projects, the majority of treatments would occur in Nevada, Idaho, Oregon, and Wyoming.

Under the Preferred Alternative, the BLM would be able to use, in the western U.S., including Alaska, the 14 active ingredients that were approved for use in the earlier RODs and for which an analysis of risks to humans and non-target plants and animals was conducted for this PEIS or by the Forest Service. These active ingredients are: 2,4-D, bromacil, chlorsulfuron, clopyralid, dicamba, diuron, glyphosate, hexazinone, imazapyr, metsulfuron methyl, picloram, sulfometuron methyl, tebuthiuron, and triclopyr.

The remaining six active ingredients currently approved for use by the BLM—2,4-DP, asulam, atrazine, fosamine, mefluidide, and simazine—have not been used, or their use has been limited to very few acres, by the BLM for several years. Although the risks to humans from the use of these chemicals are not significant based on evaluations done for the earlier EISs and a review of the literature for this

TABLE 2-5
Historic Use of Herbicides by the BLM and Projected Future Use of Herbicides by the BLM under Each Alternative (as a percentage of all acres treated using herbicides)

Active Ingredient	Historic Use (1999-2005)	Projected Use Under Each Alternative				
		No Action Alternative	Preferred Alternative	Alternative C	Alternative D	Alternative E
Herbicides Approved for Use on Public Lands						
2,4-D	16.9	18	18	0	33	20
2,4-DP	0	0	0	0	0	0
Asulam	0	0	0	0	0	0
Atrazine	0	0	0	0	0	0
Bromacil	0.7	<1	<1	0	<1	<1
Chlorsulfuron	0.9	1	1	0	1	0
Clopyralid	4.2	8	7	0	5	9
Dicamba	3.2	2	<1	0	<1	<1
Diuron	1.1	<1	<1	0	1	<1
Fosamine ammonium	0.01	0	0	0	0	0
Glyphosate	8.6	16	10	0	11	19
Hexazinone	0.4	<1	<1	0	<1	<1
Imazapyr	1.1	2	2	0	2	0
Mefluidide	0	0	0	0	0	0
Metsulfuron methyl	5.5	5	5	0	9	0
Picloram	16.4	16	15	0	26	16
Simazine	0	0	0	0	0	0
Sulfometuron methyl	7.2	<1	<1	0	2	0
Tebuthiuron	30.7	25	25	0	<1	25
Triclopyr	3.1	5	5	0	4	7
Herbicides Proposed for Use on Public Lands						
Diflufenzopyr + Dicamba	0	0	2	0	5	2
Diquat	0	0	<1	0	1	<1
Fluridone	0	0	<1	0	1	<1
Imazapic	0	0	8	0	5	0

PEIS, the risks to non-target plants and animals, especially species of concern, have not been adequately evaluated. Should these chemicals be needed by the BLM in the future, the BLM would consult ERAs for these active ingredients prepared by the Forest Service or other agencies, if available, or conduct their own ERAs, to assess the risks to non-target species. This analysis would be supported by the appropriate NEPA documentation and interagency consultation before these chemicals would be approved for use or applied on the ground.

The BLM would be allowed to use four additional active ingredients in all 17 states included in this PEIS: imazapic, diquat, diflufenzopyr (in formulation with dicamba), and fluridone. In addition, the BLM would be able to use diflufenzopyr in the future as a stand-alone active ingredient if it becomes registered for herbicidal use. These active ingredients and formulations could only be applied for uses, and at application rates, specified on the label directions. Under the Preferred Alternative, the BLM would also be able to use new active ingredients that are developed in the future if: 1) they are registered by the USEPA for use on one or more land types (e.g., rangeland, aquatic, etc.) managed by the BLM; 2) the BLM determines that the benefits of use on public lands outweigh the risks to human health and the environment; and 3) they meet evaluation criteria to ensure that the decision to use the active ingredient is supported by scientific evaluation and NEPA documentation. These evaluation criteria are discussed in more detail in Appendix E.

TABLE 2-6
Comparison of the Alternatives

Analysis Element	Alternative A (No Action)	Alternative B (Preferred Alternative)	Alternative C (No Use of Herbicides)	Alternative D (No Aerial Spraying of Herbicides)	Alternative E (No ALS-inhibiting Herbicides)
Approximate Number of Acres Treated Annually Using Herbicides:	305,000	932,000	0	530,000	466,000[1]
Treatment Planning:					
Focus of vegetation treatments[2]	Active	Active	Active	Active	Passive
Cost of treatment used as a selection criteria	No	No	No	No	Yes
Width of WUI	Variable	Variable	Variable	Variable	500 meters
Use of Treatments:					
Restrictions on acres treated using herbicides	Yes	No	Yes	No	Yes
Restrictions on types of herbicides used	Yes[3]	No	No	No	Yes[3]
Restrictions on use of herbicides in amphibian habitats[4]	Yes	Yes	Yes	Yes	Yes[5]
Restrictions on use of herbicides in areas with culturally significant plant and wildlife resources[6]	No	No	No	No	Yes

[1] Assumes that the number of acres treated using herbicides is about half the number treated for Alternative B, although not explicitly stated in the proposal.
[2] Passive treatments involve suspension of activities that cause the loss of ecological integrity; all other treatments are active.
[3] Under Alternative A, limited to herbicides approved for use in each state based on earlier EIS RODs. Under Alternative E, sulfonylurea and other acetolactate synthase-inhibiting herbicides would not be used.
[4] Restrictions on use of herbicides in areas with amphibians would be based on the ecological risk assessment, on federal, state, local, and tribal regulations, and on local experience in using herbicides. Restrictions include avoidance of glyphosate formulations that include R-11 in the future, and either avoidance using any formulations with polyoxytheyleneamine, or use of the formulation with the lowest amount of polyoxytheyleneamine available.
[5] Herbicide use would be avoided in areas with amphibians.
[6] Use of herbicides in areas with culturally significant plant and animal resources would be based on human and ecological risk assessments; on federal, state, local, and tribal regulations, and on local experience in using herbicides.

Alternative C – No Use of Herbicides

Under Alternative C, the BLM would not be able to treat vegetation using herbicides and would not be able to use new chemicals that are developed in the future. The BLM would be able to treat vegetation using fire, and mechanical, manual, and biological control methods. A PER has been prepared that accompanies this PEIS and discusses these treatment methods, proposed treatment levels during the next 10 to15 years, and likely impacts to natural and social resources on public lands from these treatment methods (USDI BLM 2007a).

Alternative D – No Aerial Application of Herbicides

This alternative is similar to the Preferred Alternative in that it represents the treatment of vegetation using herbicides in 17 western states, including Alaska, and use of the same active ingredients as allowed under the Preferred Alternative. Under Alternative D, however, only ground-based techniques would be used to apply herbicides (no aerial applications of herbicides would be allowed) to would reduce the risk of spray drift impacting non-target areas. Based on information obtained from field offices, an estimated 55% of herbicide treatments would involve use of ground-based methods during the next 10 years. Thus, the BLM would treat approximately 530,000 acres annually using herbicides under this alternative. In comparison, during 1997 to 2005, approximately 66% (80,467 acres annually) of herbicide treatments were conducted aerially and 34% (41,829 acres annually) using ground-based methods. Most aerial treatments occurred in New Mexico (47% of acres treated in western U.S.), Idaho (30%), and Arizona (8%), while states with the most acres treated using ground-based methods were Utah (20% of acres treated in western U.S.), Idaho (16%), and Wyoming (12%).

Similar to the Preferred Alternative, the BLM would be able to use new active ingredients that are developed in the future if: 1) they are registered by the USEPA for use on one or more land types (e.g., rangeland, aquatic) managed by the BLM; 2) the BLM determines that the benefits of use on BLM lands outweigh the risks to human health and the environment; and 3) they meet evaluation criteria to ensure that the decision to use the active ingredient is supported by scientific evaluation and NEPA documentation.

Alternative E – No Use of Sulfonylurea and other Acetolactate Synthase-inhibiting Active Ingredients

This alternative was developed based on an alternative proposal for vegetation management on public lands submitted by the American Lands Alliance. The proposal is entitled the "Restore Native Ecosystems Alternative" (RNEA) and the full text of the proposal is in Appendix I.

In order to determine whether this alternative had merit for analysis relative to the proposed action, or should be dismissed from detailed analysis, a comprehensive policy review of the proposal was conducted by the BLM's National Science and Technology Center during 2002.

The BLM's policy review of the RNEA is provided in Appendix I of the Final PEIS. The policy analysis comprises identification of the individual goals and actions outlined in the RNEA proposal. For each goal or action, a determination has been made whether it is included in current BLM policy (yes/no) and a citation for the policy is provided. Under policy analysis, a brief summary outlining the policy is provided. Under the alternative comparison, the alternatives that apply to the policy are identified. In most cases, the policy is "common to all alternatives." The last column outlines the programmatic net effect or impact of the policy if the analysis is different from that presented in the Final PEIS, or outside the scope of analysis.

Based on this analysis, certain components of the proposal that were relevant and applicable to herbicide use under the proposed action were carried forward into the alternative analyzed in the PEIS. The remaining content of the proposal was determined to be either already covered under existing BLM policy, and therefore already a component of the Preferred Alternative (Alternative B), or outside the scope of analysis of this PEIS.

Under Alternative E, the BLM would not use sulfonylurea and other acetolactate synthase-inhibiting active ingredients approved in the earlier RODs, which are chlorsulfuron, imazapyr, metsulfuron methyl, and sulfometuron methyl. During 1999 to 2000, these active ingredients comprised approximately 28% of the active ingredients used by the BLM. Since 2001, however, these active ingredients have comprised approximately 8% of the active ingredients used by the BLM. The BLM would be able to use, in the 17 western states, 10 active ingredients that were approved for use in the earlier RODs and for which an analysis of their risks to humans and non-target plants and animals was conducted for this PEIS. These active ingredients are: 2,4-D, bromacil, clopyralid, dicamba, diuron, glyphosate, hexazinone, picloram, tebuthiuron, and triclopyr. The six other active ingredients currently approved for use by the BLM—2,4-DP, atrazine, asulam, fosamine, mefluidide, and simazine—would not be used unless guidelines given for the Preferred Alternative were met.

In addition, the BLM would be allowed to use three additional active ingredients in all 17 states: diquat, diflufenzopyr (if it becomes registered for herbicidal use), and fluridone. The BLM would also be able to use a formulation of diflufenzopyr and dicamba. These active ingredients and formulations could only be applied for uses, and at application rates, specified on the label directions.

Under Alternative E, the BLM would be able to use new active ingredients that are developed in the future if they follow protocols for use of new active ingredients identified under the Preferred Alternative and do not contain sulfonylurea and imidazolinone chemistry and other acetolactate synthase-inhibiting compounds.

Under this alternative, the BLM would treat approximately 466,000 acres annually using herbicides (Table 2-6). Spot herbicide treatments would be favored over broadcast treatments. Herbicide use would be discouraged in areas populated by amphibians. To protect Native American and Alaska Native resources, the BLM would establish herbicide-free zones around culturally significant plant and wildlife resources.

This alternative would place greater emphasis on passive restoration, by prohibiting or restricting activities such as livestock grazing, OHV use, logging, or oil and gas development in areas where these activities have promoted a less desirable vegetation community, or increased erosion. Chapter 1, Scope of Analysis, clearly states the PEIS does not evaluate these programs. Since these activities are allowed under FLPMA, restrictions on these activities would only be considered to the extent they are consistent with BLM vegetation and land use management practices and policies (e.g. excluding grazing animals from recently seeded areas) and as determined by the authorized office under the appropriate controlling regulations.

Determination of Treatment Acreages

As discussed earlier, the BLM has been mandated under a variety of statutes and policy initiatives to increase the number of acres of vegetation treated annually to address the issues of catastrophic fire and invasive species spread and their relationships to habitat improvement and maintenance of healthy landscapes. The BLM estimates that approximately 6 million acres would need to be treated annually to meet these mandates. Acres to be treated by the BLM and assessed in this PEIS were estimated based on information provided by BLM field offices throughout the western U.S., including Alaska. Each field office was asked to estimate and summarize proposed vegetation treatment projects likely to occur during the next 10 years. For each project, the field office provided an estimate of the number of acres proposed for treatment, the general vegetation type(s) proposed for treatment, and the vegetation treatment method(s) proposed to be used. In many cases, multiple treatment methods were identified for a particular type of project. Treatments could occur on the same acres several times during 1 year, or over several years. Based on these surveys, field offices identified that approximately 4.6 million acres of treatments would be needed annually.

The BLM also reviewed Fire Regime Condition Classes (FRCCs) and concluded that an additional 1.4 million acres of treatments, beyond the estimates provided by the field offices, would be required annually. These classes were created to represent qualitative measures describing the degree of departure from historical fire regimes. This departure may have resulted from activities such as fire exclusion, timber harvesting, livestock grazing, introduction and establishment of exotic plant species, introduced insects or disease, and/or other management activities, which have altered key ecosystem components such as species composition, structural stage, stand age, canopy closure, and fuel loadings. These treatments would be focused on those areas of vegetation having a high departure from the historical condition and where the risk of losing key ecosystem components to fire or other causes is high (FRCC 3). The intent of these treatments would be to transition FRCC 3 lands to areas where fire regimes are moderately altered from their historical conditions (FRCC 2), or are within their historical range of vegetation variability (FRCC 1).

As a result of these surveys and reviews, an estimated 6 million acres would need to be treated annually. Approximately 3.5 million acres would be treated primarily for hazardous fuels reduction and to control wildfires in the WUI, approximately 1 million acres would be treated to control unwanted vegetation to restore ecosystem health, and about 1.5 million acres a year would be subject to burned area rehabilitation and emergency stabilization efforts. Acres associated with these treatments are dependent on the severity and extent of the fire season in any given year and may vary considerably from this average.

Non-herbicide Treatment Method Acreages used in Cumulative Effects Analysis

The alternatives describe differing levels of herbicide use, ranging from approximately 932,000 acres annually under Alternative B to 0 acres annually under Alternative C. However, non-herbicide treatments (manual and mechanical methods, biological control, and use of fire) would also occur under all alternatives. Although non-herbicide treatments were not evaluated in the analysis of direct and indirect effects of herbicide treatments (but were evaluated in the PER), as discussed in Chapter 1 of this PEIS under Decisions to be Made and Scope of Analysis, they are considered in the Cumulative Effects Analysis in Chapter 4 of this PEIS.

Under Alternative A, approximately 645,000 acres would be treated using fire, 582,000 acres would be treated using mechanical methods, 114,000 acres would be treated using manual methods, and 253,000 acres would be treated using biological control.

Under Alternative B, approximately 2,107,000 acres would be treated using fire, 2,232,000 acres would be treated using mechanical methods, 271,000 acres would be treated using manual methods, and 454,000 acres would be treated using biological control.

Under alternatives C, D, and E, approximately 1,055,000 acres would be treated using fire, 1,986,000 acres would be treated using mechanical methods, 396,000 acres would be treated using manual methods, and 597,000 acres would be treated using biological control.

Alternatives Considered but Not Further Analyzed

Several other alternatives were identified during public scoping and reviewed by the interdisciplinary team (ENSR 2002). In most cases, these alternatives would not fulfill the purpose and need for the project, are inconsistent with BLM or other federal, state, or local policies or regulations, or are not practical based on likely funding for vegetation treatments. The alternatives that were considered but not further analyzed are:

- **Treat up to 25 million acres annually**. This alternative was excluded from analysis because the BLM felt it was highly unlikely that the agency would have sufficient funding during the next 10 to 15 years to treat up to 25 million acres annually.
- **Treat fewer acres than are currently treated**. Under this alternative, fewer acres would be treated annually than would occur under the No Action Alternative (Alternative A). Given that current treatment levels have been insufficient to control unwanted vegetation and reduce the risk of wildfire to life and property on public lands, this alternative would not meet the project purpose and need.
- **Do not treat competing and unwanted vegetation**. Under this alternative, the BLM would continue burned area rehabilitation and emergency stabilization activities, hazardous fuels reduction activities that did not involve the treatment of vegetation, and passive vegetation management, but would not actively treat competing and unwanted vegetation. This alternative was eliminated because it would not control the spread of unwanted vegetation, which could adversely impact land health on public lands and increase the risk of loss of life and property due to fires.
- **Treat only acres needed to protect human health and safety.** Under this alternative, the BLM would only treat those acres needed to protect human health and safety. Nearly all of these acres would be associated with hazardous fuels reduction near homes and other developments in the WUI. This alternative was eliminated because it would not maintain or improve land health on most public lands.
- **Do not conduct hazardous fuels treatments.** Like the preceding alternative, this alternative was excluded because it does not restore the health of fire-adapted ecosystems. The buildup of hazardous fuels that have led to catastrophic wildfires and significant impacts to air quality, water resources, human health, and other resources.
- **Revegetate with native vegetation.** Under this alternative, only native vegetation would be used to restore fire-impacted and other degraded public lands. This alternative was eliminated because it has been incorporated into the proposed action to the extent practical.
- **Exclude logging, grazing, OHV use, and energy/mineral development on public lands.** This alternative was eliminated because FLPMA requires that the BLM manage public lands for multiple uses including those listed. Field offices, however, can limit these activities, consistent with land use plans where doing so benefits vegetation management and land health and complies with the FLPMA.

The rest of this chapter includes actions that would be common to all alternatives.

Herbicide Treatment Standard Operating Procedures and Guidelines

This section identifies standard operating procedures (SOPs) that would be followed by the BLM under all alternatives to ensure that risks to human health and the environment from herbicide treatment actions would be kept to a minimum. Standard operating procedures are the management controls and performance standards required for vegetation management treatments. These practices are intended to protect and enhance natural resources that could be affected by future vegetation treatments.

Prevention of Weeds and Early Detection and Rapid Response

Once weed populations become established, infestations can increase and expand in size. Weeds colonize highly disturbed ground and invade plant communities that have been degraded, but are also capable of invading intact communities. Therefore, prevention, early detection, and rapid response are the most cost-effective methods of weed control. Prevention, early detection, and rapid response strategies that reduce the need for vegetative treatments for noxious weeds should lead to a reduction in the number of acres treated using herbicides in the future by reducing or preventing weed establishment.

As stated in the BLM's *Partners Against Weeds - An Action Plan for the BLM* (USDI BLM 1996), prevention and public education are the highest priority weed management activities. Priorities are as follows:

- Priority 1: Take actions to prevent or minimize the need for vegetation control when and where feasible, considering the management objectives of the site.
- Priority 2: Use effective nonchemical methods of vegetation control when and where feasible.
- Priority 3: Use herbicides after considering the effectiveness of all potential methods or in combination with other methods or controls.

Prevention is best accomplished by ensuring the seeds and vegetatively reproductive plant parts of new weed species are not introduced into new areas.

The BLM is required to develop a noxious weed risk assessment when it is determined that an action may introduce or spread noxious weeds or when known habitat exists (USDI BLM 1992b). If the risk is moderate or high, the BLM may modify the project to reduce the likelihood of weeds infesting the site, and to identify control measures to be implemented if weeds do infest the site.

To prevent the spread of weeds, the BLM takes actions to minimize the amount of existing non-target vegetation that is disturbed or destroyed during project or vegetation treatment actions (Table 2-7). During project planning, the following steps are taken:

- Incorporate measures to prevent introduction or spread of weeds into project layout, design, alternative evaluation, and project decisions.
- During environmental analysis for projects and maintenance programs, assess weed risks, analyze potential treatment of high-risk sites for weed establishment and spread, and identify prevention practices.
- Determine prevention and maintenance needs, to include the use of herbicides if needed, at the onset of project planning.
- Avoid or remove sources of weed seed and propagules to prevent new weed infestations and the spread of existing weeds.

During project development, weed infestations are prioritized for treatment in project operating areas and along access routes. Weeds present on or near the site are identified, a risk assessment is completed, and weeds are controlled as necessary. Project staging areas are weed free, and travel through weed infested areas is avoided or minimized. Examples of prevention actions to be followed during project activities include cleaning all equipment and clothing before entering the project site; avoiding soil disturbance and the creation of other soil conditions that promote weed germination and establishment; and using weed-free seed, hay, mulch, gravel, soil, and mineral materials on public lands where there is a state or county program in place.

Conditions that enhance invasive species abundance should be addressed when developing mitigation and prevention plans for activities on public lands. These conditions include excessive disturbance associated with road maintenance, poor grazing management, and high levels of recreational use. If livestock grazing is managed to maintain the vigor of native perennial plants, particularly grasses, the chance of weeds invading rangeland is much less. By carefully managing recreational use and educating the public on the potential impacts of recreational activities on vegetation, the amount of damage to native vegetation and soil can be minimized at high use areas, such as campgrounds and OHV trails. Early detection in recreation areas is focused on roads and trails, where much of the weed spread occurs.

The BLM participates in the National Early Warning and Rapid Response System for Invasive Plants (Figure

TABLE 2-7
Prevention Measures

BLM Activity	Prevention Measure
Project Planning	• Incorporate prevention measures into project layout and design, alternative evaluation, and project decisions to prevent the introduction or spread of weeds. • Determine prevention and maintenance needs, including the use of herbicides, at the onset of project planning. • Before ground-disturbing activities begin, inventory weed infestations and prioritize areas for treatment in project operating areas and along access routes. • Remove sources of weed seed and propagules to prevent the spread of existing weeds and new weed infestations. • Pre-treat high-risk sites for weed establishment and spread before implementing projects. • Post weed awareness messages and prevention practices at strategic locations such as trailheads, roads, boat launches, and public land kiosks. • Coordinate project activities with nearby herbicide applications to maximize the cost-effectiveness of weed treatments.
Project Development	• Minimize soil disturbance to the extent practical, consistent with project objectives. • Avoid creating soil conditions that promote weed germination and establishment. • To prevent weed germination and establishment, retain native vegetation in and around project activity areas and keep soil disturbance to a minimum, consistent with project objectives. • Locate and use weed-free project staging areas. Avoid or minimize all types of travel through weed-infested areas, or restrict travel to periods when the spread of seeds or propagules is least likely. • Prevent the introduction and spread of weeds caused by moving weed-infested sand, gravel, borrow, and fill material. • Inspect material sources on site, and ensure that they are weed-free before use and transport. Treat weed-infested sources to eradicate weed seed and plant parts, and strip and stockpile contaminated material before any use of pit material. • Survey the area where material from treated weed-infested sources is used for at least 3 years after project completion to ensure that any weeds transported to the site are promptly detected and controlled. • Prevent weed establishment by not driving through weed-infested areas. • Inspect and document weed establishment at access roads, cleaning sites, and all disturbed areas; control infestations to prevent spread within the project area. • Avoid acquiring water for dust abatement where access to the water is through weed-infested sites. • Identify sites where equipment can be cleaned. Clean equipment before entering public lands. • Clean all equipment before leaving the project site if operating in areas infested with weeds. • Inspect and treat weeds that establish at equipment cleaning sites. • Ensure that rental equipment is free of weed seed. • Inspect, remove, and properly dispose of weed seed and plant parts found on workers' clothing and equipment. Proper disposal entails bagging the seeds and plant parts and incinerating them.
Revegetation	• Include weed prevention measures, including project inspection and documentation, in operation and reclamation plans. • Retain bonds until reclamation requirements, including weed treatments, are completed, based on inspection and documentation. • To prevent conditions favoring weed establishment, re-establish vegetation on bare ground caused by project disturbance as soon as possible using either natural recovery or artificial techniques. • Maintain stockpiled, uninfested material in a weed-free condition.

TABLE 2-7 (Cont.)
Prevention Measures

BLM Activity	Prevention Measure
Revegetation (Cont.)	• Revegetate disturbed soil (except travel ways on surfaced projects) in a manner that optimizes plant establishment for each specific project site. For each project, define what constitutes disturbed soil and objectives for plant cover revegetation. Revegetation may include topsoil replacement, planting, seeding, fertilization, liming, and weed-free mulching, as necessary. • Where practical, stockpile weed-seed-free topsoil and replace it on disturbed areas (e.g., road embankments or landings). • Inspect seed and straw mulch to be used for site rehabilitation (for wattles, straw bales, dams, etc.) and certify that they are free of weed seed and propagules. • Inspect and document all limited term ground-disturbing operations in noxious weed infested areas for at least 3 growing seasons following completion of the project. • Use native material where appropriate and feasible. Use certified weed-free or weed-seed-free hay or straw where certified materials are required and/or are reasonably available. • Provide briefings that identify operational practices to reduce weed spread (for example, avoiding known weed infestation areas when locating fire lines). • Evaluate options, including closure, to regulate the flow of traffic on sites where desired vegetation needs to be established. Sites could include road and trail ROW, and other areas of disturbed soils.

2-2). The goal of this System to minimize the establishment and spread of new invasive species through a coordinated framework of public and private processes by:

- Early detection and reporting of suspected new plant species to appropriate officials;
- Identification and vouchering of submitted specimens by designated specialists;
- Verification of suspected new state, regional, and national plant records;
- Archival of new records in designated regional and plant databases;
- Rapid assessment of confirmed new records; and
- Rapid response to verified new infestations that are determined to be invasive.

Herbicide Treatment Planning

BLM Manual 9011 (*Chemical Pest Control*) outlines the policies, and BLM Handbook H-9011-1 (*Chemical Pest Control*; USDI BLM 1988d) outlines the procedures, for use of herbicides on public lands. As part of policy, the BLM is required to thoroughly evaluate the need for chemical treatments and their potential for impact on the environment. The BLM is required to use only USEPA-registered herbicides that have been properly evaluated under NEPA, and to carefully follow label directions and additional BLM requirements.

An operational plan is developed and updated for each herbicide project. The plan includes information on project specifications, key personnel responsibilities, and communication, safety, spill response, and emergency procedures. For application of herbicides not approved for aquatic use, the plan should also specify minimum buffer widths between treatment areas and water bodies. Recommended widths are provided in BLM Handbook H-9011-1 (*Chemical Pest Control*), but actual buffers are site and herbicide active ingredient specific, and are determined based on a scientific analysis of environmental factors, such as climate, topography, vegetation, and weather; timing and method of application; and herbicide risks to humans and non-target species. Recommended buffer widths for each herbicide active ingredient under different application scenarios are listed later in this chapter under Mitigation. Table 2-8 summarizes important SOPs that should be used when applying herbicides to help protect resources of concern on public lands.

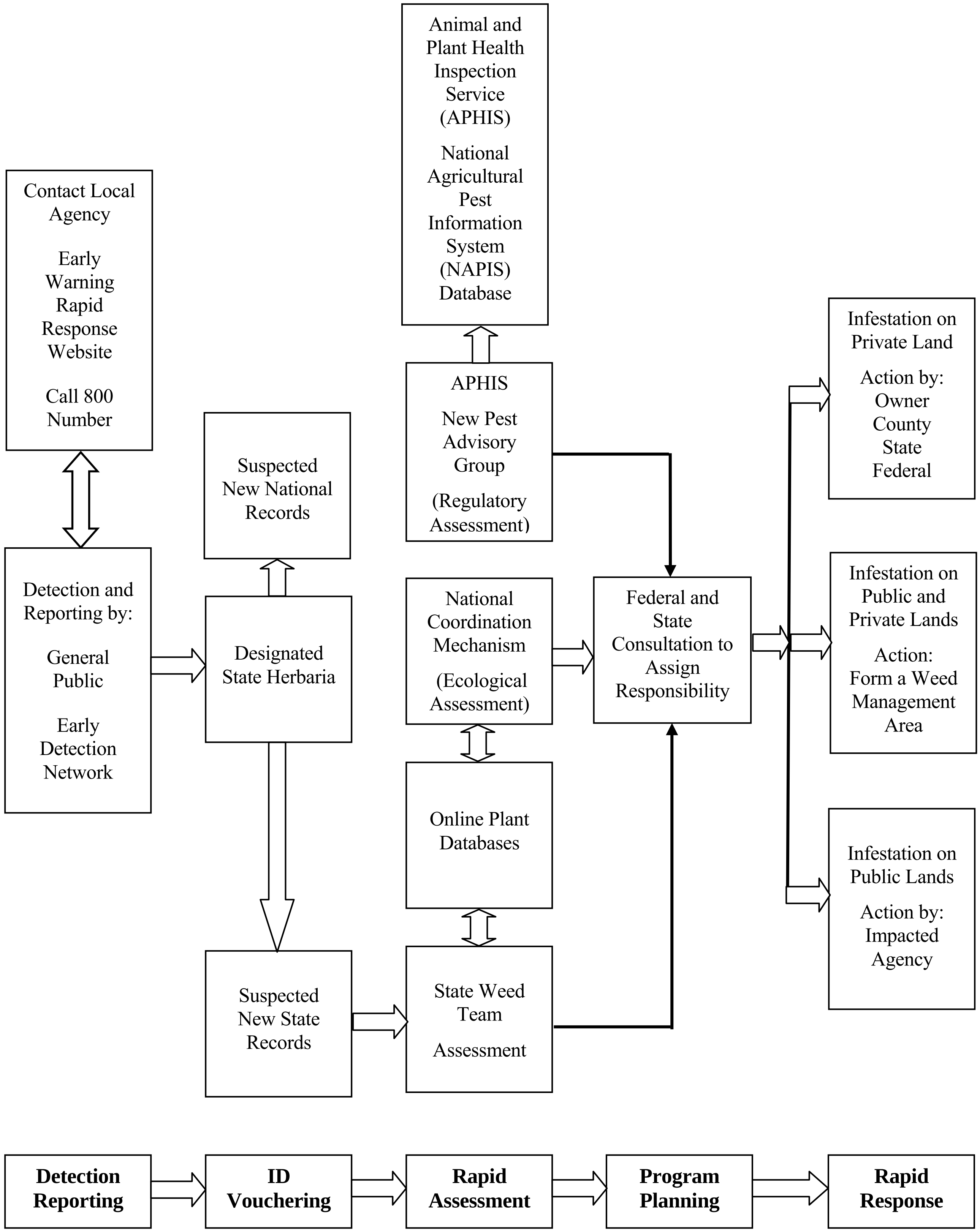

Figure 2-2. National Early Warning and Rapid Response System for Invasive Plants.

Revegetation

Disturbed areas may be reseeded or planted with desirable vegetation when the native plant community cannot recover and occupy the site sufficiently.

Determining the need for revegetation is an integral part of developing a vegetation treatment. The most important component of the process is determining whether active (seeding/planting) or passive (natural recovery) revegetation is appropriate.

USDI policy states, "Natural recovery by native plant species is preferable to planting or seeding, either of natives or non-natives. However, planting or seeding should be used only if necessary to prevent unacceptable erosion or resist competition from non-native invasive species" (620 Departmental Memorandum 3 2004). This policy is reiterated in the USDI *Burned Area Emergency Stabilization and Rehabilitation* Manual, the BLM *Burned Area Emergency Stabilization and Rehabilitation* Manual (BLM H-1742-1; USDI BLM 2006a), and the *Interagency Burned Area Rehabilitation Guidebook* (USDI and USDA 2006d).

In addition to these handbooks and policy, use of native and non-native seed in revegetation and restoration is guided by BLM Manual 1745 (*Introduction, Transplant, Augmentation and Reestablishment of Fish, Wildlife and Plants).* This manual states that native species shall be used, unless it is determined through the NEPA process that: 1) suitable native species are not available; 2) the natural biological diversity of the proposed management area will not be diminished; 3) exotic and naturalized species can be confined within the proposed management area; 4) analysis of ecological site inventory information indicates that a site will not support reestablishment of a species that historically was part of the natural environment; or 5) resource management objectives cannot be met with native species.

When natural recovery is not feasible, revegetation can be used to stabilize and restore vegetation on disturbed sites and to eliminate or reduce the conditions that favor invasive species. Reseeding or replanting may be required when there is insufficient vegetation or seed stores to naturally revegetate the site.

To ensure revegetation success, there must be adequate soil for root development and moisture storage, which provides moisture to support the new plants. Chances for revegetation success are improved by selecting seed with high purity and percentage germination; selecting native species or cultivars adapted to the area; planting at proper depth, seeding rate, and time of the year for the region; choosing the appropriate planting method; and, where feasible, removing competing vegetation. Planting mixtures are adapted for the treatment area and site uses. A combination of forbs, perennial grasses, and shrubs is typically used on rangeland sites, while shrubs and trees might be favored for riparian and forestland sites. A mixture of several native plant species and types or functional groups enhances the value of the site for fish and wildlife and improves the health and aesthetic character of the site. Mixtures can better take advantage of variable soil, terrain, and climatic conditions, and thus are more likely to withstand insect infestations and survive adverse climatic conditions.

The USDI BLM Native Seed program, which is in its sixth year, was developed in response to Congressional direction to supply native plant material for emergency stabilization and longer-term rehabilitation and restoration efforts. The focus of the program is to increase the number of native plant species for which seed is available and the total amount of native seed available for these efforts. To date, the program has focused on native plant material needs of emergency stabilization and burned area rehabilitation in the Great Basin, but is expanding to focus on areas such as western Oregon, the Colorado Plateau, and most recently the Mojave Desert. The Wildland Fire Management Program funds and manages the effort (USDI BLM 2006c).

The National Seed Warehouse is a storage facility for the native seed supply. Through a Memorandum of Understanding with the BLM Idaho State Director, each state (Idaho, Oregon, Nevada, Utah and Colorado) can reserve an annual seed supply for purchase based on a reasonable projection of annual acreage to be stabilized or rehabilitated over a 5-year period.

The Great Basin Restoration Initiative (GBRI) grew out of concern for the health of the Great Basin after the wildfires of 1999. The goal of GBRI is to implement treatments and strategies to maintain functioning ecosystems and to proactively restore degraded ones at strategic locations. Native plants are emphasized in restoration projects where their use is practical and the potential for success is satisfactory. Monitoring is recommended to measure treatment success. To increase the availability of native plants, especially native forbs, the GBRI has established a collaborative native plant project, the Great Basin Native Plant Selection and Increase Project, to increase native plant availability and the technology to successfully establish these plants. This project is supported by funding from the BLM's Native Plant Initiative.

The BLM will follow the following SOPs when revegetating sites:

- Cultivate previously disturbed sites to reduce the amount of weed seeds in the soil seedbank.
- Revegetate sites once work is completed or soon after a disturbance.
- When available, use native seed of known origin as labeled by state seed certification programs.
- Use seed of non-native cultivars and species only when locally adapted native seed is not available or when it is unlikely to establish quickly enough to prevent soil erosion or weed establishment.
- Use seed that is free of noxious and invasive weeds, as determined and documented by a seed inspection test by a certified seed laboratory.
- Limit nitrogen fertilizer applications that favor annual grass growth over forb growth in newly seeded areas, especially where downy brome and other invasive annuals are establishing.
- Use clean equipment, free of plants and plant parts, on revegetation projects to prevent the inadvertent introduction of weeds into the site.
- Where important pollinator resources exist, include native nectar and pollen producing plants in the seed mixes used in restoration and reclamation projects. Include non-forage plant species in seed mixes for their pollinator/host relationships as foraging, nesting, or shelter species. Choose native plant species over manipulated cultivars, especially of forbs and shrubs, since natives tend to have more valuable pollen and nectar resources than cultivars. Ensure that bloom times for the flowers of the species chosen match the activity times for the pollinators. Maintain sufficient litter on the soil surfaces of native plant communities for ground-nesting bees.
- Where feasible, avoid grazing by domestic and wild animals on treatment sites until vegetation is well established. Where total rest from grazing is not feasible, efforts should be made to modify the amount and/or season of grazing to promote vegetation recovery within the treatment area. Reductions in numbers, permanent or temporary fencing, changes in grazing rotation, and identification of alternative forage sources are examples of methods that could be used to remove, reduce or modify grazing impacts during vegetation recovery.

Special Precautions

Special Status Species

Federal policies and procedures for protecting federally-listed threatened and endangered plant and animal species, and species proposed for listing, were established by the Endangered Species Act of 1973 and regulations issued pursuant to the Act. The purposes of the Act are to provide mechanisms for the conservation of threatened and endangered species and their habitats. Under the Act, the Secretary of the Interior is required to determine which species are threatened or endangered and to issue recovery plans for those species.

Section 7 of the Act specifically requires all federal agencies to use their authorities in furtherance of the Act to carry out programs for the conservation of listed species, and to ensure that no agency action is likely to jeopardize the continued existence of a listed species or adversely modify critical habitat. Policy and guidance (BLM Manual 6840; *Special Status Species*) also stipulates that species proposed for listing must be managed at the same level of protection as listed species.

The BLM state directors may designate special status in cooperation with their respective state. These special status species must receive, at a minimum, the same level of protection as federal candidate species. The BLM will also carry out management for the conservation of state-listed species, and state laws protecting these species will apply to all BLM programs and actions to the extent that they are consistent with FLPMA and other federal laws.

The BLM consulted with the USFWS and NMFS during development of the PEIS as required under Section 7 of the Endangered Species Act. As part of this process, the BLM prepared a formal consultation package that included a description of the program; species listed as threatened or endangered, species proposed for listing, and critical habitats that could be affected by the program; and a BA that evaluated the likely impacts to listed species, species proposed for listing, and critical habitats from the proposed vegetation treatment program. Over 300 species were evaluated in the BA. The BA also provides broad guidance at a programmatic level for actions that would be taken by the BLM to avoid adversely impacting species or critical habitat (USDI BLM 2007b).

Before any vegetation treatment or ground disturbance occurs, BLM policy requires a survey of the project site for species listed or proposed for listing, or special status species. This is done by a qualified biologist and/or botanist who consults the state and local databases and visits the site at the appropriate season. If a proposed project may affect a proposed or listed species or its critical habitat, the BLM consults with the USFWS and/or NMFS. A project with a "may affect, likely to adversely affect" determination requires formal consultation and receives a Biological Opinion from the USFWS and/or NMFS. A project with a "may affect, not likely to adversely affect" determination requires informal consultation and receives a concurrence letter from USFWS and/or NMFS, unless that action is implemented under the authorities of the alternative consultation agreement pursuant to counterpart regulations established for *National Fire Plan* projects.

Wilderness Areas

Wilderness areas, which are designated by Congress, are defined by the Wilderness Act of 1964 as places "where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain." The BLM manages 175 Wilderness Areas encompassing over 7.2 million acres (USDI BLM 2006d).

Activities allowed in wilderness areas are identified in wilderness management plans prepared by the BLM. The BLM does not ordinarily treat vegetation in wilderness areas, but will control invasive and noxious weeds when they threaten lands outside wilderness area or are spreading within the wilderness and can be controlled without serious adverse impacts to wilderness values.

Management of vegetation in a wilderness area is directed toward retaining the natural character of the environment. Tree and shrub removal is usually not allowed, except for fire, insect, or disease control. Reforestation is generally prohibited except to repair damage caused by humans in areas where natural reforestation is unlikely. Only native species and primitive methods, such as hand planting, are allowed for reforestation.

Tools and equipment may be used for vegetation management when they are the minimum amount necessary for the protection of the wilderness resource. Motorized tools may only be used in special or emergency cases involving the health and safety of wilderness visitors, or the protection of wilderness values.

Habitat manipulation using mechanical or chemical means may be allowed to protect threatened and endangered species and to correct unnatural conditions, such as weed infestations, resulting from human influence.

The BLM also manages a total of 610 Wilderness Study Areas (WSAs) encompassing nearly 14.3 million acres. These are areas that have been determined to have wilderness characteristics worthy of consideration for wilderness designation. The BLM's primary goals in WSAs are to manage them so as to not impair their wilderness values and to maintain their suitability for preservation as wilderness until Congress makes a determination on their future.

In WSAs, the BLM must foster a natural distribution of native species of plants and animals by ensuring that ecosystems and processes continue to function naturally.

Cultural Resources

The effects of BLM actions on cultural resources are addressed through compliance with the National Historic Preservation Act, as implemented through a national Programmatic Agreement (*Programmatic Agreement among the Bureau of Land Management, the Advisory Council on Historic Preservation, and the National Conference of State Historic Preservation Officers Regarding the Manner in Which BLM Will Meet Its Responsibilities Under the National Historic Preservation Act*) and state-specific protocol agreements with SHPOs. The BLM's responsibilities under these authorities are addressed as early in the vegetation management project planning process as possible.

TABLE 2-8
Standard Operating Procedures for Applying Herbicides

Resource Element	Standard Operating Procedure
Guidance Documents	BLM Handbook H-9011-1 (*Chemical Pest Control*); and manuals 1112 (*Safety*), 9011 (*Chemical Pest Control*), 9012 (*Expenditure of Rangeland Insect Pest Control Funds*), 9015 (*Integrated Weed Management)*, and 9220 (*Integrated Pest Management*)
General	• Prepare spill contingency plan in advance of treatment. • Conduct a pretreatment survey before applying herbicides. • Select herbicide that is least damaging to environment while providing the desired results. • Select herbicide products carefully to minimize additional impacts from degradates, adjuvants, inert ingredients, and tank mixtures. • Apply the least amount of herbicide needed to achieve the desired result. • Follow product label for use and storage. • Have licensed applicators apply herbicides. • Use only USEPA-approved herbicides and follow product label directions and "advisory" statements. • Review, understand, and conform to the "Environmental Hazards" section on the herbicide label. This section warns of known pesticide risks to the environment and provides practical ways to avoid harm to organisms or to the environment. • Consider surrounding land use before assigning aerial spraying as a treatment method and avoid aerial spraying near agricultural or densely populated areas. • Minimize the size of application areas, when feasible. • Comply with herbicide-free buffer zones to ensure that drift will not affect crops or nearby residents/landowners. • Post treated areas and specify reentry or rest times, if appropriate. • Notify adjacent landowners prior to treatment. • Keep copy of Material Safety Data Sheets (MSDSs) at work sites. MSDSs available for review at http://www.cdms.net/. • Keep records of each application, including the active ingredient, formulation, application rate, date, time, and location. • Avoid accidental direct spray and spill conditions to minimize risks to resources. • Consider surrounding land uses before aerial spraying. • Avoid aerial spraying during periods of adverse weather conditions (snow or rain imminent, fog, or air turbulence). • Make helicopter applications at a target airspeed of 40 to 50 miles per hour (mph), and at about 30 to 45 feet above ground. • Take precautions to minimize drift by not applying herbicides when winds exceed >10 mph (>6 mph for aerial applications) or a serious rainfall event is imminent. • Use drift control agents and low volatile formulations. • Conduct pre-treatment surveys for sensitive habitat and special status species within or adjacent to proposed treatment areas. • Consider site characteristics, environmental conditions, and application equipment in order to minimize damage to non-target vegetation. • Use drift reduction agents, as appropriate, to reduce the drift hazard to non-target species. • Turn off applied treatments at the completion of spray runs and during turns to start another spray run. • Refer to the herbicide label when planning revegetation to ensure that subsequent vegetation would not be injured following application of the herbicide. • Clean OHVs to remove seeds.

TABLE 2-8 (Cont.)
Standard Operating Procedures for Applying Pesticides

Resource Element	Standard Operating Procedure
Air Quality See Manual 7000 (*Soil, Water, and Air Management*)	• Consider the effects of wind, humidity, temperature inversions, and heavy rainfall on herbicide effectiveness and risks. • Apply herbicides in favorable weather conditions to minimize drift. For example, do not treat when winds exceed 10 mph (6 mph for aerial applications) or rainfall is imminent. • Use drift reduction agents, as appropriate, to reduce the drift hazard. • Select proper application equipment (e.g., spray equipment that produces 200- to 800-micron diameter droplets [spray droplets of 100 microns and less are most prone to drift]). • Select proper application methods (e.g., set maximum spray heights, use appropriate buffer distances between spray sites and non-target resources).
Soil See Manual 7000 (*Soil, Water, and Air Management*)	• Minimize treatments in areas where herbicide runoff is likely, such as steep slopes when heavy rainfall is expected. • Minimize use of herbicides that have high soil mobility, particularly in areas where soil properties increase the potential for mobility. • Do not apply granular herbicides on slopes of more than 15% where there is the possibility of runoff carrying the granules into non-target areas.
Water Resources See Manual 7000 (*Soil, Water, and Air Management*)	• Consider climate, soil type, slope, and vegetation type when developing herbicide treatment programs. • Select herbicide products to minimize impacts to water. This is especially important for application scenarios that involve risk from active ingredients in a particular herbicide, as predicted by risk assessments. • Use local historical weather data to choose the month of treatment. Considering the phenology of the target species, schedule treatments based on the condition of the water body and existing water quality conditions. • Plan to treat between weather fronts (calms) and at appropriate time of day to avoid high winds that increase water movements, and to avoid potential stormwater runoff and water turbidity. • Review hydrogeologic maps of proposed treatment areas .Note depths to groundwater and areas of shallow groundwater and areas of surface water and groundwater interaction. Minimize treating areas with high risk for groundwater contamination.. • Conduct mixing and loading operations in an area where an accidental spill would not contaminate an aquatic body. • Do not rinse spray tanks in or near water bodies. Do not broadcast pellets where there is danger of contaminating water supplies. • Maintain buffers between treatment areas and water bodies. Buffer widths should be developed based on herbicide- and site-specific criteria to minimize impacts to water bodies. • Minimize the potential effects to surface water quality and quantity by stabilizing terrestrial areas as quickly as possible following treatment.
Wetlands and Riparian Areas	• Use a selective herbicide and a wick or backpack sprayer. • Use appropriate herbicide-free buffer zones for herbicides not labeled for aquatic use based on risk assessment guidance, with minimum widths of 100 feet for aerial, 25 feet for vehicle, and 10 feet for hand spray applications.
Vegetation See Handbook H-4410-1 (*National Range Handbook*), and manuals 5000 (*Forest Management*) and 9015 (*Integrated Weed Management*)	• Refer to the herbicide label when planning revegetation to ensure that subsequent vegetation would not be injured following application of the herbicide. • Use native or sterile species for revegetation and restoration projects to compete with invasive species until desired vegetation establishes • Use weed-free feed for horses and pack animals. Use weed-free straw and mulch for revegetation and other activities. • Identify and implement any temporary domestic livestock grazing and/or supplemental feeding restrictions needed to enhance desirable vegetation recovery following treatment. Consider adjustments in the existing grazing permit, needed to maintain desirable vegetation on the treatment site.

TABLE 2-8 (Cont.)
Standard Operating Procedures for Applying Pesticides

Resource Element	Standard Operating Procedure
Pollinators	• Complete vegetation treatments seasonally before pollinator foraging plants bloom. • Time vegetation treatments to take place when foraging pollinators are least active both seasonally and daily. • Design vegetation treatment projects so that nectar and pollen sources for important pollinators and resources are treated in patches rather than in one single treatment. • Minimize herbicide application rates. Use typical rather than maximum rates where there are important pollinator resources. • Maintain herbicide free buffer zones around patches of important pollinator nectar and pollen sources. • Maintain herbicide free buffer zones around patches of important pollinator nesting habitat and hibernacula. • Make special note of pollinators that have single host plant species, and minimize herbicide spraying on those plants (if invasive species) and in their habitats.
Fish and Other Aquatic Organisms See manuals 6500 (*Wildlife and Fisheries Management*) and 6780 (*Habitat Management Plans*)	• Use appropriate buffer zones based on label and risk assessment guidance. • Minimize treatments near fish-bearing water bodies during periods when fish are in life stages most sensitive to the herbicide(s) used, and use spot rather than broadcast or aerial treatments. • Use appropriate application equipment/method near water bodies if the potential for off-site drift exists. • For treatment of aquatic vegetation, 1) treat only that portion of the aquatic system necessary to achieve acceptable vegetation management; 2) use the appropriate application method to minimize the potential for injury to desirable vegetation and aquatic organisms; and 3) follow water use restrictions presented on the herbicide label.
Wildlife See manuals 6500 (*Wildlife and Fisheries Management*) and 6780 (*Habitat Management Plans*)	• Use herbicides of low toxicity to wildlife, where feasible. • Use spot applications or low-boom broadcast operations where possible to limit the probability of contaminating non-target food and water sources, especially non-target vegetation over areas larger than the treatment area. • Use timing restrictions (e.g., do not treat during critical wildlife breeding or staging periods) to minimize impacts to wildlife. • Avoid using glyphosate formulations that include R-11 in the future, and either avoid using any formulations with POEA, or seek to use the formulation with the lowest amount of POEA available, to reduce risks to amphibians.
Threatened, Endangered, and Sensitive Species See Manual 6840 (*Special Status Species*)	• Survey for special status species before treating an area. Consider effects to special status species when designing herbicide treatment programs. • Use a selective herbicide and a wick or backpack sprayer to minimize risks to special status plants. • Avoid treating vegetation during time-sensitive periods (e.g., nesting and migration, sensitive life stages) for special status species in area to be treated.
Livestock See Handbook H-4120-1 (*Grazing Management*)	• Whenever possible and whenever needed, schedule treatments when livestock are not present in the treatment area. Design treatments to take advantage of normal livestock grazing rest periods, when possible. • As directed by the herbicide label, remove livestock from treatment sites prior to herbicide application, where applicable. • Use herbicides of low toxicity to livestock, where feasible. • Take into account the different types of application equipment and methods, where possible, to reduce the probability of contamination of non-target food and water sources. • Avoid use of diquat in riparian pasture while pasture is being used by livestock. • Notify permittees of the project to improve coordination and avoid potential conflicts and safety concerns during implementation of the treatment. • Notify permittees of livestock grazing, feeding, or slaughter restrictions, if necessary. • Provide alternative forage sites for livestock, if possible.

TABLE 2-8 (Cont.)
Standard Operating Procedures for Applying Pesticides

Resource Element	Standard Operating Procedure
Wild Horses and Burros	• Minimize using herbicides in areas grazed by wild horses and burros. • Use herbicides of low toxicity to wild horses and burros, where feasible. • Remove wild horses and burros from identified treatment areas prior to herbicide application, in accordance with label directions for livestock. • Take into account the different types of application equipment and methods, where possible, to reduce the probability of contaminating non-target food and water sources.
Cultural Resources and Paleontological Resources See handbooks H-8120-1 (*Guidelines for Conducting Tribal Consultation*) and H-8270-1 (*General Procedural Guidance for Paleontological Resource Management*), and manuals 8100 (*The Foundations for ManagingCultural Resources*), 8120 (*Tribal Consultation Under Cultural Resource Authorities*), and 8270 (*Paleontological Resource Management*), See also: *Programmatic Agreement among the Bureau of Land Management, the Advisory Council on Historic Preservation, and the National Conference of State Historic Preservation Officers Regarding the Manner in Which BLM Will Meet Its Responsibilities Under the National Historic Preservation Act*.	• Follow standard procedures for compliance with Section 106 of the National Historic Preservation Act as implemented through the *Programmatic Agreement among the Bureau of Land Management, the Advisory Council on Historic Preservation, and the National Conference of State Historic Preservation Officers Regarding the Manner in Which BLM Will Meet Its Responsibilities Under the National Historic Preservation Act* and state protocols or 36 CFR Part 800, including necessary consultations with State Historic Preservation Officers and interested tribes. • Follow BLM Handbook H-8270-1 (*General Procedural Guidance for Paleontological Resource Management*) to determine known Condition I and Condition 2 paleontological areas, or collect information through inventory to establish Condition 1 and Condition 2 areas, determine resource types at risk from the proposed treatment, and develop appropriate measures to minimize or mitigate adverse impacts. • Consult with tribes to locate any areas of vegetation that are of significance to the tribe and that might be affected by herbicide treatments. • Work with tribes to minimize impacts to these resources. • Follow guidance under Human Health and Safety in areas that may be visited by Native peoples after treatments.
Visual Resources See handbooks H-8410-1 (*Visual Resource Inventory*) and H-8431-1 (*Visual Resource Contrast Rating*), and manual 8400 (*Visual Resource Management*)	• Minimize the use of broadcast foliar applications in sensitive watersheds to avoid creating large areas of browned vegetation. • Consider the surrounding land use before assigning aerial spraying as an application method. • Minimize off-site drift and mobility of herbicides (e.g., do not treat when winds exceed 10 mph; minimize treatment in areas where herbicide runoff is likely; establish appropriate buffer widths between treatment areas and residences) to contain visual changes to the intended treatment area. • If the area is a Class I or II visual resource, ensure that the change to the characteristic landscape is low and does not attract attention (Class I), or if seen, does not attract the attention of the casual viewer (Class II). • Lessen visual impacts by: 1) designing projects to blend in with topographic forms; 2) leaving some low-growing trees or planting some low-growing tree seedlings adjacent to the treatment area to screen short-term effects; and 3) revegetating the site following treatment. • When restoring treated areas, design activities to repeat the form, line, color, and texture of the natural landscape character conditions to meet established Visual Resource Management (VRM) objectives.

TABLE 2-8 (Cont.)
Standard Operating Procedures for Applying Pesticides

Resource Element	Standard Operating Procedure
Wilderness and Other Special Areas See handbooks H-8550-1 (*Management of Wilderness Study Areas (WSAs)*), and H-8560-1 (*Management of Designated Wilderness Study Areas*), and Manual 8351 (*Wild and Scenic Rivers*)	• Encourage backcountry pack and saddle stock users to feed their livestock only weed-free feed for several days before entering a wilderness area. • Encourage stock users to tie and/or hold stock in such a way as to minimize soil disturbance and loss of native vegetation. • Revegetate disturbed sites with native species if there is no reasonable expectation of natural regeneration. • Provide educational materials at trailheads and other wilderness entry points to educate the public on the need to prevent the spread of weeds. • Use the “minimum tool” to treat noxious and invasive vegetation, relying primarily on use of ground-based tools, including backpack pumps, hand sprayers, and pumps mounted on pack and saddle stock. • Use chemicals only when they are the minimum method necessary to control weeds that are spreading within the wilderness or threaten lands outside the wilderness. • Give preference to herbicides that have the least impact on non-target species and the wilderness environment. • Implement herbicide treatments during periods of low human use, where feasible. • Address wilderness and special areas in management plans. • Maintain adequate buffers for Wild and Scenic Rivers (¼ mile on either side of river, ½ mile in Alaska).
Recreation See Handbook H-1601-1 (*Land Use Planning Handbook, Appendix C*)	• Schedule treatments to avoid peak recreational use times, while taking into account the optimum management period for the targeted species. • Notify the public of treatment methods, hazards, times, and nearby alternative recreation areas. • Adhere to entry restrictions identified on the herbicide label for public and worker access. • Post signs noting exclusion areas and the duration of exclusion, if necessary. • Use herbicides during periods of low human use, where feasible.
Social and Economic Values	• Consider surrounding land use before selecting aerial spraying as a method, and avoid aerial spraying near agricultural or densely-populated areas. • Post treated areas and specify reentry or rest times, if appropriate. • Notify grazing permittees of livestock feeding restrictions in treated areas, if necessary, as per label instructions. • Notify the public of the project to improve coordination and avoid potential conflicts and safety concerns during implementation of the treatment. • Control public access until potential treatment hazards no longer exist, per label instructions. • Observe restricted entry intervals specified by the herbicide label. • Notify local emergency personnel of proposed treatments. • Use spot applications or low-boom broadcast applications where possible to limit the probability of contaminating non-target food and water sources, especially vegetation over areas larger than the treatment area. • Consult with Native American tribes and Alaska Native groups to locate any areas of vegetation that are of significance to the tribe and that might be affected by herbicide treatments. • To the degree possible within the law, hire local contractors and workers to assist with herbicide application projects and purchase materials and supplies, including chemicals, for herbicide treatment projects through local suppliers. • To minimize fears based on lack of information, provide public educational information on the need for vegetation treatments and the use of herbicides in an Integrated Pest Management program for projects proposing local use of herbicides.

TABLE 2-8 (Cont.)
Standard Operating Procedures for Applying Pesticides

Resource Element	Standard Operating Procedure
Rights-of-way	• Coordinate vegetation management activities where joint or multiple use of a ROW exists. • Notify other public land users within or adjacent to the ROW proposed for treatment. • Use only herbicides that are approved for use in ROW areas.
Human Health and Safety	• Establish a buffer between treatment areas and human residences based on guidance given in the HHRA, with a minimum buffer of ¼ mile for aerial applications and 100 feet for ground applications, unless a written waiver is granted. • Use protective equipment as directed by the herbicide label. • Post treated areas with appropriate signs at common public access areas. • Observe restricted entry intervals specified by the herbicide label. • Provide public notification in newspapers or other media where the potential exists for public exposure. • Have a copy of MSDSs at work site. • Notify local emergency personnel of proposed treatments. • Contain and clean up spills and request help as needed. • Secure containers during transport. • Follow label directions for use and storage. • Dispose of unwanted herbicides promptly and correctly.

The BLM meets its responsibilities for consultation and government-to-government relationships with Native American tribes by consulting with appropriate tribal representatives prior to taking actions that affect tribal interests. The BLM's tribal consultation policies are detailed in BLM Manual 8120 (*Tribal Consultation Under Cultural Resource Authorities)* and Handbook H-8120-1 (*Guidelines for Conducting Tribal Consultation).* The BLM consulted with Native American tribes and Alaska Native groups during development of this PEIS. Information gathered on important tribal resources and potential impacts to these resources from herbicide treatments is presented in the analysis of impacts.

When conducting vegetation treatments, field office personnel consult with relevant parties (including tribes, native groups, and SHPOs), assess the potential of the proposed treatment to affect cultural and subsistence resources, and devise inventory and protection strategies suitable to the types of resources present and the potential impacts to them.

Herbicide treatments, for example, are unlikely to affect buried cultural resources, but might have a negative effect on traditional cultural properties comprised of plant foods or materials significant to local tribes and native groups. These treatments require inventory and protection strategies that reflect the different potential of each treatment to affect various types of cultural resources.

Impacts to significant cultural resources are avoided through project redesign or are mitigated through data recovery, recordation, monitoring, or other appropriate measures. When cultural resources are discovered during vegetation treatment, appropriate actions are taken to protect these resources.

Monitoring

Monitoring ensures that vegetation management is an adaptive process that continually builds upon past successes and learns from past mistakes. The regulations of 43 CFR 1610.4-9 require that land use plans establish intervals and standards for monitoring and evaluating of land management actions. During preparation of implementation plans, treatment objectives, standards, and guidelines are stated in measurable terms, where feasible, so that treatment outcomes can be measured, evaluated, and used to guide future treatment actions. This approach ensures that vegetation treatment processes are effective, adaptive, and based on prior experience.

The diversity of plant communities on BLM lands calls for a diversity of monitoring approaches. Monitoring strategies may vary in time and space depending on the species. Sampling designs and techniques vary depending on the type of vegetation. Guidance on monitoring methodologies can be found in such BLM documents as *Measuring and Monitoring Plant Populations* (BLM Technical Reference 1730-1), which was developed in cooperation with The Nature Conservancy. Other guidance documents include *Sampling Vegetation Attributes* (Interagency Technical Reference 4400-4), developed in cooperation with the Forest Service, the Natural Resource Conservation Service, and the Cooperative Extension Service; and the *Ecological Site Inventory* (BLM Inventory and Monitoring Technical Reference 1734-7). These documents, as well as numerous other guidance documents for specific plant communities, can be found on the National Science and Technology Center website (http://www.blm.gov/nstc). These documents, plus any regionally specific documents developed to meet management objectives allow for the flexibility needed to monitor the variety of vegetation on public lands.

Two types of monitoring of vegetation treatments may be pursued by the BLM. One type is implementation monitoring which answers the question, "Did we do what we said we would do?" The second type is effectiveness monitoring, which answers the question, "Were treatment and restoration projects effective?" Implementation monitoring is usually done at the land use planning level or through annual work plan accomplishment reporting. Effectiveness monitoring is usually done at the local project implementation level.

Invasive plant implementation monitoring for non-herbicide treatments is accomplished through site revisits performed during the growing season of the target species to determine if treatments were implemented correctly and the best time for follow-up treatments.

For herbicide use, implementation monitoring is accomplished through the use of Pesticide Use Proposals (PUPs) and Pesticide Application Records. Both documents are required by the BLM in order to track pesticide use annually. The PUP requires reporting of the pesticide proposed for use and the maximum application rate. It also requires reporting of the number and timing of applications. Targeted species and non-targeted species at the treatment site are described, as well as the other site characteristics. A description of sensitive resources and mitigation measures to protect these resources is also required. Most importantly, the integrated weed management approach to be taken (i.e., the combination of treatments to be used) is required. The NEPA document that analyzes the effects of the treatment must also be referenced. PUPs must be signed by a certified weed applicator, the field office manager, state coordinator, and deputy state director before the treatment can go forward. The Pesticide Application Record, which must be completed within 24 hours after completion of the application, documents the actual rate of application and that all the above factors have been taken into account. Pesticide Application Records are used to develop annual state summaries of herbicide use for BLM.

PUPs and Pesticide Application Records can also be used for more site-specific implementation monitoring. For example, the Application Record can be used to track whether the application was made at the correct time, if mitigation for sensitive wildlife concerns is included in the PUP.

Monitoring of invasive plant treatment effectiveness can range from site visits to compare the targeted population size against pre-treatment inventory data, to comparing pre-treatment and post-treatment photo points, to more elaborate transect work, depending on the species and site-specific variables. The goals of monitoring should be to answer questions such as the following:

- What changes in the distribution, amount, and proportion of invasive plant infestations have resulted due to treatments?
- Has infestation size been reduced at the project level or larger scale (such as a watershed)?
- Which treatment methods, separate or in combination, are most successful for a particular species? (USDA Forest Service 2005).

Monitoring data can have far-reaching applications in fire management because it provides the scientific basis for planning and implementing future burn treatments. Measuring post-fire ecosystem response allows the BLM to understand the consequences of fire on important ecosystem components and to share this knowledge in a scientifically based language. Monitoring is the critical feedback loop that allows fire management to constantly improve prescriptions and fire plans based on the new knowledge gained from field measurements. FIREMON is an interagency monitoring program that is used for monitoring fuels treatment effectiveness. When a fuels treatment project involves an invasive species (such as tamarisk or Russian olive), monitoring can be done using a program such as FIREMON.

Another monitoring protocol frequently used to inventory and monitor forest vegetation is called the Forest Vegetation Information System or FORVIS. FORVIS is a system for storage, retrieval, and analysis of data about forestlands. These data describe existing vegetation, classify sites relative to current condition, can be used in forest growth and structure and wildlife habitat models, describe landscapes, aid in developing forest restoration treatments, and provide a record of treatment and disturbance events.

BLM monitoring activities also include the BLM Legacy program, which is an outgrowth of the need to provide current BLM field managers and specialists with an opportunity to learn about past land management practices and land treatments, and to evaluate the results of those practices 25 or more years later (USDI BLM 2002c). The Legacy program is intended to bring together current land managers and specialists with retired and active employees who performed the land treatments in the past. The underlying philosophy of the program is that if BLM land managers do not learn from the past, they cannot know which treatments are effective and which are not.

The *Healthy Forests Restoration Act of 2003* instructs the BLM to establish a collaborative multiparty monitoring, evaluation, and accountability process when significant interest is expressed in such an approach. The process is used to assess the positive and negative ecological and social effects of projects carried out under Healthy Forests Restoration Act authority. Multiparty monitoring can be an effective way to build trust and collaboration with local communities and diverse stakeholders, including interested citizens and tribes.

The results of monitoring should be made available to interested parties. A website with links to geospatial and other data sets will ensure that inventory data, and treatment methods and results, are shared easily. The BLM has a website, http://www.blm.gov, with links to BLM programs, such as the weed program, and other data sources, including geospatial data. Most state offices are tied into state data clearinghouses that contain useful information gathered by federal, state, and local agencies.

Monitoring Guidance used by BLM in Vegetation Management

The BLM has prepared numerous guidance and strategy documents to aid field personnel in developing and implementing monitoring plans and strategies. These include the following:

- ***BLM National Monitoring Strategy (2006).*** The BLM is currently developing a national strategy to manage the collection, storage, and use of data describing the interrelationship of resource conditions, resource uses, and the BLM's own activities. The goals of the strategy are to: 1) enhance the efficiency and effectiveness of the BLM's assessment, inventory, and monitoring efforts; 2) establish and use a limited number of resource indicators that are common to most or all BLM field offices, and that are comparable or identical to measures used by other government agencies and non-governmental organizations; and 3) standardize data collection, evaluation, and reporting in a way that improves the quality of the BLM's land use planning and other management decisions, and enhances the BLM's ability to manage for multiple uses.

- ***BLM Land Use Planning Handbook H-1601-1 (2005).*** Establishes requirements for periodic implementation and effectiveness monitoring for land use planning decisions.

- ***Monitoring Manual for Grasslands, Shrubland, and Savanna Ecosystems Vols. I and II. USDA Agricultural Research Service (2005).*** Provides quantitative methods to address indicators of rangeland health.

- ***BLM Technical Reference 1730-2 Biological Soil Crusts (2001).*** Provides technical guidance on how to develop and implement effective monitoring plans for biological soil crusts.

- ***BLM Handbook H-4180-1 Rangeland Health Standards (2001).*** Provides technical guidance on evaluating rangeland health, developing plans to improve rangeland health, and monitoring the progress of rangeland health plans.

- ***BLM Technical Reference 1730-1 Measuring and Monitoring Plant Populations (1998).*** Provides technical guidance on how to develop and implement effective monitoring plans for vegetation and use monitoring in adaptive management.

- ***BLM Technical Reference 1734-4 Sampling Vegetative Attributes (1996).*** Provides the basis for consistent, uniform, and standard vegetation attribute sampling that is economical, repeatable, statistically reliable, and technically adequate.

- ***Manual Section 9011 Chemical Pest Control (1992).*** Establishes requirements for monitoring pesticide applications.

- ***Manual Section 9014 Use of Biological Control Agents of Pests on Public Lands (1990).*** Establishes requirements to monitor success or failure in survival, control, and spread of biological agents.

- ***Guidelines for Coordinated Management of Noxious Weeds (1990).*** Provides guidance on establishing monitoring plans for noxious weeds and their control.

- ***BLM Handbook H-4400-1 Range Monitoring and Evaluation (1989).*** Provides technical guidance on how to measure vegetation uses such as livestock grazing, wild horse and burro use, and wildlife browsing and foraging.

- ***BLM Handbook H-9011-1 Chemical Pest Control (1988).*** Provides technical guidance on post-treatment evaluations for pesticide applications to occur within 2 years of treatment.

- ***NEPA Handbook H-1790-1 Chapter VI – Monitoring (1988).*** All actions and mitigation measures, including monitoring and enforcement programs, adopted in a decision document are legally enforceable commitments. The purposes of monitoring in a NEPA context are to 1) ensure compliance with decisions, 2) measure effectiveness of decisions, and 3) evaluate validity of decisions.

- ***Manual Section 1734 Monitoring and Inventory Coordination (1983).*** Provides the BLM with technical guidance on how to develop and implement effective monitoring plans for vegetation.

Numerous other technical references for inventory, monitoring, and assessment are found at: http://www.blm.gov/nstc/library/techref.htm. In addition, state-specific handbooks to guide monitoring based on the national level guidance (e.g., *Nevada Monitoring Handbook, Oregon Monitoring Handbook*).

Monitoring Methods and Research

Fuels treatment and noxious weed control projects must begin with an understanding of which techniques and monitoring methods are most effective, as determined through careful research and follow-up monitoring. The BLM has been supporting research at universities and Forest Service research stations through the Joint Fire Science program and projects such as the Great Basin Restoration Initiative. The Joint Fire Science program has supported research on such topics as fire effects, effects from fuels treatments, and the use of fire as a tool in controlling invasive plants (http://jfsp.nifc.gov/). Under the Great Basin Restoration Initiative, ongoing projects involving weed control, restoration, and fire treatments help provide a link between science and management to ensure that ecologically-based restoration is implemented. These projects are summarized at http://www.fire.blm.gov/gbri/technology.html.

Dissemination of research and monitoring results and information occurs in a variety of ways, including formal conferences and workshops of fire management professionals, the National Science and Technology Center, publications such as Resource Notes, and BLM state websites. Snapshots, an online publication found at http://www.fire.blm.gov/snapshots.htm, highlights BLM projects that support the *National Fire Plan*. Examples of successful projects and community collaborations that have been discussed in Snapshots include creation and monitoring of fuels breaks, habitat improvement through prescribed burning, fuels reduction and associated monitoring, and the progress of a downy brome taskforce. Examples of project successes include the following:

- In Wyoming, a multi-agency prescribed burn was completed in 2005 to reduce hazardous fuels and improve the health and vigor of native plant communities. Monitoring methods include permanent vegetation transects and photo points to provide post-burn results and an elk collaring study to show which treatment areas are being used by elk. The information obtained during this study will be shared with the public, and the site will be used by school classes.

- In Wyoming, a tamarisk reduction project was started in the Bighorn Basin in 2000 to restore native cottonwood galleries. The project involves various combinations of treatments, as well as plantings of native species following the treatments.

- In Washington, the BLM has been treating reed canarygrass since 2003, using a combination of prescribed burning, herbicides, and mowing, followed by seedbed preparation and reseeding with native seed mixtures. This project is a partnership with the Natural Resource Conservation Service, Washington State Department of Fish and Wildlife, and the U.S. Fish and Wildlife Service.

BLM offices maintain monitoring reports to document that fuels treatments meet set objectives. Monitoring plans typically include plots and photo points, at which pre- and post-treatment data are collected. This type of monitoring has successfully provided data that has allowed the BLM to confirm that project goals have been met.

Coordination and Education

As demonstrated at public scoping meetings for the PEIS, the public is deeply interested in BLM vegetation treatment activities, especially individuals that live in close proximity to public lands, have commercial operations dependant on vegetation on or adjacent to public lands, or use public lands for recreation. The BLM strives to keep the public informed about its vegetation treatment activities through regular coordination and communication. The BLM also encourages the public to participate in the environmental review process during the development and analysis of local vegetation management programs.

Several laws and Executive Orders set forth public involvement requirements, including involving the public in the environmental analysis, land use planning, and implementation decision-making processes to address local, regional, and national interests (USDI BLM 2000f).

The BLM is ultimately responsible for land use plan decisions, including decisions about vegetation management, on public lands. The BLM has found, however, that collaborative relationships with stakeholders, including individuals, communities, and governments, improves communication, provides a greater understanding of different perspectives, and helps to find solutions to issues and problems. Input from the public and government agencies has been critical during development of this PEIS and the PER.

The NEPA process ensures that the public is allowed input into vegetation management actions on public lands. For treatment projects requiring an EA or EIS, the BLM must notify the public of the proposed project and give the public the opportunity to comment on the site-specific analysis done for the project. Treatment actions may be modified in response to comments posed by the public. The public may also be invited to observe treatment activities and participate in project monitoring.

Public lands are often commingled with private lands, or lands under the jurisdiction of tribal, state, or local governments or other federal agencies. Multijurisdictional planning assists land use planning efforts when there is a mix of land ownership and government authorities, and there are opportunities to develop complementary decisions across jurisdictional boundaries.

Examples of these planning efforts include development of weed treatment programs involving the BLM and nearby private landowners, or coordination with parties who hold land use authorizations including ROW, leases, permits, or easements. Many BLM weed coordinators hold classes for public land users to make them aware of the problem and to solicit their help in reporting new weed infestations.

Because vegetation treatments have a direct effect on the productivity and use of grazing allotments, coordination and consultation with the grazing permittee(s), and any other interested parties affected by a vegetation treatment, would be necessary.

It is critical that the BLM notify potentially affected parties of treatment activities that occur on public lands. This can be done through a letter, phone call, meeting, newsletter, newspaper article, or other medium to ensure that potentially affected parties can comment on the proposed action and take any steps needed to protect life and property from proposed actions.

Prior to herbicide treatments, the BLM posts entry points onto public lands where the herbicide application will take place. Information provided in the posting will includes herbicide product applied; active ingredients; USEPA registration number; application date; period of time which must elapse before a person without protective clothing may enter a treatment site; and other warnings or information required to ensure the safety of the public.

The BLM enjoys wide participation in various national, state, and local prevention and education efforts pertaining to noxious and invasive species and hazardous fuels management. The BLM participates in state FireWise programs, state Fire Safe Councils, the National Wildfire Coordinating Group Wildland Fire Education Working Team, and the National Wildland Fire Prevention and Education Team. Local education efforts such as Project: FIRE bring BLM natural resource professionals into schools to educate students about fire prevention and safety. Noxious weed and invasive species education programs span the K-12 grades and are led by many local BLM field office ecologists and natural resource professionals. The BLM also participates in Project Learning Tree. Project Learning Tree, one of the most widely-used environmental education programs in the country, provides education curricula for fire and invasive species education.

Mitigation

Table 2-9 identifies the measures the BLM proposes to mitigate adverse environmental impacts identified in Chapter 4 (Environmental Consequences). As defined by CEQ regulation 1508.20, mitigation includes: 1) avoiding the impact altogether by not taking a certain action or parts of an action; 2) minimizing impacts by limiting the degree or magnitude of the action and its implementation; 3) rectifying the impact by repairing, rehabilitating, or restoring the affected environment; 4) reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; and 5) compensating for the impact by replacing or providing substitute resources or environments.

Numerous mitigation measures were developed from information provided in ERAs and during development of this PEIS. The measures listed below would apply to plants, animals, and other resources at the programmatic level in all 17 western states. However, local BLM field offices could use interactive spreadsheets and other information contained in the ERAs to develop more site-specific mitigation and management plans based on local conditions (e.g., soil type, rainfall, vegetation type, herbicide treatment method, and herbicide application rate). It is possible that mitigation measures would be less restrictive than those listed below if local site conditions were evaluated using the ERAs when developing project-level mitigation plans. In addition, the BLM may be able to use timing restrictions or similar practices to reduce the level of risk to an acceptable level. For example, it may be necessary to apply diuron at the typical herbicide application rate to ensure protection of a migratory bird species. However, it may be acceptable to use the maximum application rate during periods of the year when the bird has migrated from the treatment area. Local field managers would consult the ERAs and review species life history requirements before making these decisions to ensure that birds and other resources are adequately protected.

Summary of Impacts by Alternative

Table 2-10 summarizes the likely effects of vegetation treatments using herbicides for each alternative. Information contained in this table is discussed in more detail in Chapter 4 (Environmental Consequences).

TABLE 2-9
Mitigation Measures

Resource	Mitigation Measures
Air Quality	None proposed.
Soil Resources	None proposed.
Water Resources and Quality	• Establish appropriate (herbicide specific) buffer zones to downstream water bodies, habitats, and species/populations of interest (see Appendix C, Table C-16).
Wetland and Riparian Areas	• See mitigation for Water Resources and Quality and Vegetation.
Vegetation	• Minimize the use of terrestrial herbicides (especially bromacil, diuron, and sulfometuron methyl) in watersheds with downgradient ponds and streams if potential impacts to aquatic plants are of concern. • Establish appropriate (herbicide specific) buffer zones around downstream water bodies, habitats, and species/populations of interest. Consult the ERAs for more specific information on appropriate buffer distances under different soil, moisture, vegetation, and application scenarios. • To protect special status plant species, implement all conservation measures for plants presented in the *Vegetation Treatments on Bureau of Land Management Lands in 17 Western States Programmatic Biological Assessment*.
Fish and Other Aquatic Organisms	• Limit the use of diquat in water bodies that have native fish and aquatic resources. • Limit the use of terrestrial herbicides in watersheds with characteristics suitable for potential surface runoff, that have fish-bearing streams, during periods when fish are in life stages most sensitive to the herbicide(s) used. • To protect special status fish and other aquatic organisms, implement all conservation measures for aquatic animals presented in the *Vegetation Treatments on Bureau of Land Management Lands in 17 Western States Programmatic Biological Assessment*. • Establish appropriate herbicide-specific buffer zones for water bodies, habitats, or fish or other aquatic species of interest (see Appendix C, Table C-16, and recommendations in individual ERAs). • Avoid using the adjuvant R-11® in aquatic environments, and either avoid using glyphosate formulations containing POEA, or seek to use formulations with the least amount of POEA, to reduce risks to aquatic organisms.
Wildlife	• To minimize risks to terrestrial wildlife, do not exceed the typical application rate for applications of dicamba, diuron, glyphosate, hexazinone, tebuthiuron, or triclopyr, where feasible. • Minimize the size of application areas, where practical, when applying 2,4-D, bromacil, diuron, and Overdrive® to limit impacts to wildlife, particularly through contamination of food items. • Where practical, limit glyphosate and hexazinone to spot applications in rangeland and wildlife habitat areas to avoid contamination of wildlife food items. • Avoid using the adjuvant R-11® in aquatic environments, and either avoid using glyphosate formulations containing POEA, or seek to use formulations with the least amount of POEA, to reduce risks to amphibians. • Do not apply bromacil or diuron in rangelands, and use appropriate buffer zones (see Vegetation section in Chapter 4) to limit contamination of off-site vegetation, which may serve as forage for wildlife. • Do not aerially apply diquat directly to wetlands or riparian areas. • To protect special status wildlife species, implement all conservation measures for terrestrial animals presented in the *Vegetation Treatments on Bureau of Land Management Lands in 17 Western States Programmatic Biological Assessment*. Apply these measures to special status species (refer to conservation measures for a similar size and type of species, of the same trophic guild).

TABLE 2-9
Mitigation Measures (Cont.)

Resource	Mitigation Measures
Livestock	• Minimize potential risks to livestock by applying diuron, glyphosate, hexazinone, tebuthiuron, and triclopyr at the typical application rate, where feasible. • Do not apply 2,4-D, bromacil, dicamba, diuron, Overdrive®, picloram, or triclopyr across large application areas, where feasible, to limit impacts to livestock, particularly through the contamination of food items. • Where feasible, limit glyphosate and hexazinone to spot applications in rangeland. • Do not aerially apply diquat directly to wetlands or riparian areas used by livestock. • Do not apply bromacil or diuron in rangelands, and use appropriate buffer zones (see Vegetation section in Chapter 4) to limit contamination of off-site rangeland vegetation.
Wild Horses and Burros	• Minimize potential risks to wild horses and burros by applying diuron, glyphosate, hexazinone, tebuthiuron, and triclopyr at the typical application rate, where feasible. • Consider the size of the application area when making applications of 2,4-D, bromacil, dicamba, diuron, Overdrive®, picloram, and triclopyr in order to reduce potential impacts to livestock. • Apply herbicide label grazing restrictions for livestock to herbicide treatment areas that support populations of wild horses and burros. • Where feasible, limit glyphosate and hexazinone to spot applications in rangeland. • Do not apply bromacil or diuron in grazing lands within herd management areas, and use appropriate buffer zones (see Vegetation section in Chapter 4) to limit contamination of vegetation in off-site foraging areas. • Do not apply 2,4-D, bromacil, or diuron in herd management areas during the peak foaling season (March through June, and especially in May and June), and do not exceed the typical application rate of Overdrive® or hexazinone in HMAs during the peak foaling season.
Paleontological and Cultural Resources	• Do not exceed the typical application rate when applying 2,4-D, bromacil, diquat, diuron, fluridone, hexazinone, tebuthiuron, and triclopyr in known traditional use areas. • Avoid applying bromacil or tebuthiuron aerially in known traditional use areas. • Limit diquat applications to areas away from high residential and traditional use areas to reduce risks to Native Americans and Alaska Natives.
Visual Resources	None proposed.
Wilderness and Other Special Areas	Mitigation measures that may apply to wilderness and other special area resources are associated with human and ecological health and recreation. Please refer to the Vegetation, Fish and Other Aquatic Resources, Wildlife Resources, Recreation, and Human Health and Safety sections of Chapter 4.
Recreation	Mitigation measures that may apply to recreational resources are associated with human and ecological health. Please refer to the Vegetation, Fish and Other Aquatic Resources, Wildlife Resources, and Human Health and Safety sections of Chapter 4.
Social and Economic Values	None proposed.
Human Health and Safety	• Use the typical application rate, where feasible, when applying 2,4-D, 2,4-DP, atrazine, bromacil, diquat, diuron, fluridone, fosamine, hexazinone, tebuthiuron, and triclopyr to reduce risk to occupational and public receptors. • Avoid applying atrazine, bromacil, diuron, or simazine aerially. • Limit application of chlorsulfuron via ground broadcast applications at the maximum application rate. • Limit diquat application to ATV, truck spraying, and boat applications to reduce risks to occupational receptors; limit diquat applications to areas away from high residential and subsistence use to reduce risks to public receptors. • Evaluate diuron applications on a site-by-site basis to avoid risks to humans. There appear to be few scenarios where diuron can be applied without risk to occupational receptors. • Do not apply hexazinone with an over-the-shoulder broadcast applicator.

TABLE 2-10
Summary and Comparison of Effects on Resources by Alternative

No Action Alternative	Preferred Alternative	Alternative C	Alternative D	Alternative E
EFFECTS ON AIR QUALITY				
General Effects: None of the predicted annual emissions by pollutant or state would exceed prevention of significant deterioration (PSD) annual emissions significance thresholds. Treatments would result in approximately 77 tons per year (tpy) of total suspended particles (TSP), 24 tpy of carbon monoxide (CO), and 17 tpy of PM_{10} (particulate matter less than 10 microns in diameter). These emissions are lower than emissions all other herbicide treatment alternatives.	**General Effects:** None of the predicted annual emissions by pollutant or state would exceed PSD annual emissions significance thresholds. Particulate matter concentrations from treatments are expected to be substantially lower than NAAQS thresholds based on modeling. Treatments would result in approximately 206 tpy of TSP, 62 tpy of CO, and 45 tpy of PM_{10}. These emissions are twice those predicted for the No Action Alternative, with half of the emissions occurring in Idaho and Nevada.	**General Effects:** Herbicides would not be used for vegetation management. There would be no herbicide treatment-related emissions associated with this alternative.	**General Effects:** None of the predicted annual emissions by pollutant or state would exceed PSD annual emissions significance thresholds. Particulate matter (PM) concentrations are substantially lower than NAAQS thresholds at sample locations. Treatments would result in approximately 257 tpy of TSP, 83 tpy of CO, and 55 tpy of PM_{10}, greater than the amount of emissions generated under the Preferred Alternative, even though 40% fewer acres would be treated. The elevated amounts of emissions are primarily related to the reliance on ground equipment for treatment applications. However, herbicide drift would likely be less than under the other herbicide treatment alternatives.	**General Effects:** None of the predicted annual emissions by pollutant or state would exceed PSD annual emissions significance thresholds. PM concentrations are substantially lower than NAAQS thresholds at sample locations. Treatments would result in approximately 106 tpy of TSP, 32 tpy of CO, and 23 tpy of PM_{10}, about twice those of the No Action Alternative and half those of the Preferred Alternative.
Cumulative Effects: The cumulative effects of all agricultural, commercial, industrial, and other activities that have emitted air pollutants in the western U.S. and Alaska have contributed to deterioration in air quality. Despite increases in these activities and in human population, total emissions of principal air pollutants peaked in the 1970s and early 1980s and have generally declined during the past 2 decades. BLM treatment activities have contributed < 1% of criteria pollutants nationwide in recent years. Emissions associated with fire use and other treatment methods under the action alternatives would increase from current levels, but would still comprise < 1% of total pollutants generated nationwide. Most emissions would be associated with the use of fire. However, emissions associated with wildfire are generally greater than those associated with prescribed fire on a per unit area basis. Smoke emissions would be reduced by permitting fires only during meteorological periods favorable to dispersion and avoiding population centers. BLM efforts to use vegetation treatments, including fire use, to restore historical fire regimes, native vegetation, and natural ecosystem processes should reduce the frequency and intensity of wildfire, resulting in less accumulation of pollutants than would occur under the No Action Alternative. Although 40% fewer acres would be treated using herbicides (the number of acres treated using other treatment methods would be similar between the two alternatives), criteria pollutant emissions would be greater under Alternative D than the Preferred Alternative because herbicide treatments would be ground-based, while much of the acreage treated under the Preferred Alternative would be applied using aircraft. Exceedances of NAAQS would not occur under any alternatives. Improvements in pollution control technology should further reduce pollutants associated with vegetation treatments in the future.				
EFFECTS ON SOIL RESOURCES				
Under the No Action Alternative, approximately 305,000 acres would be treated annually. None of the herbicides likely to be used would result in severe effects to	Under the Preferred Alternative, approximately 932,000 acres would be treated annually. None of the herbicides likely to be used would result in severe effects to	Under Alternative C, herbicides would not be used for vegetation management; thus there would be no effects to soil from herbicides. Because herbicides would not be	Under Alternative D, approximately 530,000 acres would be treated annually. The risk of inadvertent applications to soils off of public lands would be	Under Alternative E, approximately 466,000 acres would be treated annually. ALS-inhibiting herbicides would not be used under this alternative.

TABLE 2-10 (Cont.)
Summary and Comparison of Effects on Resources by Alternative

No Action Alternative	Preferred Alternative	Alternative C	Alternative D	Alternative E
soil. Because fewer acres would be treated under this alternative than under the other herbicide treatment alternatives, benefits to soil from treatments (e.g., improved soil productivity, reduced soil erosion) would be less under this alternative than under the other treatment alternatives.	soil. New herbicides proposed for use would have minor effects on soil, but should help reduce populations of invasive species. Because more acres would be treated under this alternative than under the other alternatives, benefits to soil from treatments (e.g., improved soil productivity, reduced soil erosion) would be greatest under this alternative. Herbicides could also be used to benefit soils in Alaska, Nebraska, and Texas if treatments occurred there.	used to treat vegetation, invasive plant populations could increase and adversely affect soil resources in areas where herbicide treatments are the only practical method of treatment. Other treatment methods (manual, mechanical, biological, and use of prescribed fire) could also disturb and harm soil and could be more detrimental to soil in a treatment area than the use of herbicides.	less under this alternative than under the other treatment alternatives. In areas where ground-based treatments were ineffective or too costly to implement, vegetation control might not occur, potentially resulting in adverse effects to soil. Because fewer acres would be treated under this alternative than under the Preferred Alternative, benefits to soil from treatments (e.g., improved soil productivity, reduced soil erosion) would be less. New herbicides proposed for use would have minor effects on soil, but should help reduce populations of invasive species. It is likely that the BLM would use less imazapic under this alternative than under the Preferred Alternative. Herbicides could also be used to benefit soils in Alaska, Nebraska, and Texas if treatments occurred there.	However, ALS-inhibiting herbicides have not been found to be more toxic to soil organisms or to demonstrate other soil effects notably different from the other herbicides available to, or proposed for use by, the BLM. Thus, there could be greater impacts to soil under this alternative if the BLM uses non-ALS-inhibiting herbicides. This alternative would discourage activities that are known to harm soils (e.g., OHV use, livestock grazing). Because fewer acres would be treated under this alternative than under the Preferred Alternative, benefits to soil from treatments (e.g., improved soil productivity, reduced soil erosion) would be less. In addition, the BLM would not be able to use imazapic, which has been proposed for treatment of downy brome. Catastrophic fires and damage to soil in the Great Basin and elsewhere in the western U.S. have been attributed to the growth and spread of downy brome. Herbicides could also be used to benefit soils in Alaska, Nebraska, and Texas if treatments occurred there.
Cumulative Effects: Human activities associated with commodity extraction, agriculture, and urbanization, and more recently with large-scale, catastrophic wildfire have resulted in soil erosion and loss of soil productivity on public lands and throughout the West. Soils in Alaska have been impacted by mineral extraction, logging, and oil and gas development. Treatments would lead to loss of vegetation and soil, but long-term improvement in ecosystems should restore soil and improve soil productivity. Several recently implemented conservation programs by the BLM will also improve soil on rangelands. Rangeland health on public lands has shown improvement over the past 2 decades, and nationwide, the rate of soil loss has slowed. Short-term soil loss would be greatest under the Preferred Alternative, but long-term improvement in soil function would be greatest under this alternative. Soil loss would be irretrievable, but soil productivity on degraded lands could be retrieved over decades or centuries.				
EFFECTS ON WATER RESOURCES AND QUALITY				
Impacts to surface and groundwater quality would be	Benefits and risks to water quality and quantity would be greatest	There would be no effects from herbicides on water quality. In	The BLM would be unable to treat large areas with herbicides.	Under this alternative, ALS-inhibiting herbicides would not

TABLE 2-10 (Cont.)
Summary and Comparison of Effects on Resources by Alternative

No Action Alternative	Preferred Alternative	Alternative C	Alternative D	Alternative E
similar to the ongoing program. Herbicides most commonly used are known groundwater contaminants (2,4-D, glyphosate, picloram, and tebuthiuron), and several other herbicides that may be used (2,4-DP, atrazine, and simazine) are also known groundwater contaminants. Impacts to water quality and quality, and benefits to watersheds from herbicide treatments would be lowest under this alternative.	under this alternative. Of new herbicides proposed for use, diquat and fluridone are effective in controlling aquatic plants to improve water quality in lakes and streams, but diquat is a known groundwater contaminant. Imazapic is not known to contaminate groundwater and in upland treatments could serve as a replacement for herbicides that are known groundwater contaminants. Removal of unwanted vegetation should improve hydrologic functions in treated watersheds. The BLM would also be able to use herbicides to improve watershed function and water resources and quality in Alaska, Nebraska, and Texas, although no herbicide treatments are currently proposed for Alaska and Nebraska.	areas with weeds and other infestations, hydrologic functions could deteriorate in areas where herbicide treatments are the only effective treatment method.	Thus, benefits to watersheds from large-scale herbicide treatments would not occur. Fire use and mechanical treatments could replace herbicide treatments in some areas, but could be less effective and cause greater soil disturbance, leading to reduced water quality. Risk of herbicide drift, in terms of reducing off-site contamination of water bodies, would be lower under this alternative than under the other treatment alternatives. The BLM would be able to use herbicides to improve watershed function and water resources and quality in Alaska, Nebraska, and Texas, although no herbicide treatments are currently proposed for Alaska and Nebraska.	impact surface water and groundwater quality. Passive treatments promoted under this alternative could benefit watersheds long-term, but would have few short-term benefits. Restrictions on herbicide treatments in riparian areas would limit the risk of adverse impact from herbicides on water resources in these areas, but would also limit long-term gains from treatment of unwanted vegetation. The BLM would be able to use herbicides to improve watershed function and water resources and quality in Alaska, Nebraska, and Texas, although no herbicide treatments are currently proposed for Alaska and Nebraska.
Cumulative Effects: As a result of human activities, 21% of watersheds nationwide have serious water quality problems. Commodity extraction, livestock grazing, fire suppression, and spread of weeds have contributed to water quality problems on public lands, primarily from high turbidity and sediment levels and high water temperatures. Future BLM efforts will focus on watersheds where water quality does not meet state or tribal standards. Management of weeds and other invasive vegetation and restoration of natural fire regimes would cause erosion and sedimentation over the short term, but treatments should improve watershed health over the long term. In Alaska, most aquatic areas are of high quality, although there are water quality concerns associated with mining and oil and gas development. Short-term impacts and long-term improvements would be greatest under the Preferred Alternative. There would be more emphasis on passive management to improve ecosystem health under Alternative E, but this management would have to be considered within the multiple use requirements of FLPMA. An accidental spill of an herbicide or a major fire would cause damage to water bodies that could result in irretrievable reduced production or the deaths of individual organisms in the short-term. Over the long term, effects of treatments on water resources and quality could be reversed under all alternatives.				
EFFECTS ON WETLAND AND RIPARIAN AREAS				
Potential benefits and risks of using herbicides would be lowest under this alternative. Approximately 2,300 acres of wetland and riparian areas would be treated. The BLM would not be able to use four herbicides proposed for use that would be more effective in treating vegetation in or near wetland and	Potential benefits and risks of using herbicides would be greatest under this alternative. Approximately 10,000 acres of wetland and riparian areas would be treated. The BLM would be able to use four herbicides proposed for use that would be more effective in treating vegetation in or near wetland and	Possible ecosystem benefits of not using herbicides include the elimination of risks associated with accidental spills, drift, and persistence of herbicides on non-target biota. However, the risk of noxious weeds and invasive vegetation spreading are greatest under this alternative, especially for plant species that cannot be	Risk of herbicide drift, in terms of reducing off-site contamination of wetland and riparian areas, would be lower under this alternative than under the other treatment alternatives (although differences would be small because few acres [< 2%] would be treated by air under alternatives A, B, and E). However, control of unwanted	Under this alternative, ALS-inhibiting herbicides would not impact surface water and groundwater quality. Passive treatments and limits on the use of livestock and OHV activity (within the limitations of the FLPMA) could benefit riparian and wetland areas. Restrictions on use of herbicides in riparian

TABLE 2-10 (Cont.)
Summary and Comparison of Effects on Resources by Alternative

No Action Alternative	Preferred Alternative	Alternative C	Alternative D	Alternative E
riparian areas and that have similar or lower ecological risks than herbicides currently available for use by the BLM.	riparian areas and that have similar or lower ecological risks than herbicides available for use by the BLM. The BLM would also be able to use new herbicides in the future that may be even more effective and safer than currently-available herbicides. The BLM would be able to treat unwanted wetland and riparian vegetation in Alaska, Nebraska, and Texas.	effectively controlled using other treatment methods. It could be more difficult for the BLM to effectively treat unwanted vegetation in remote riparian and wetland areas using non-herbicide treatment methods.	upland vegetation over large and/or remote areas would be more difficult, reducing benefits to watershed that could improve downslope wetland and riparian areas. The BLM would be able to treat unwanted wetland and riparian vegetation in Alaska, Nebraska, and Texas.	conservation areas could benefit these areas, unless noxious weeds or other invasive vegetation were present that would not effectively be controlled using other treatment methods. The BLM would be able to treat unwanted wetland and riparian vegetation in Alaska, Nebraska, and Texas.
Cumulative Effects: An estimated 53% of wetlands have been lost in the U.S., and much of the remaining habitat has become degraded from agriculture, commodity extraction, urbanization, and other human activities. The spread of weeds and fire suppression have also caused some wetland and riparian areas on public lands to fail to function properly. To correct this situation, vegetation treatments would be focused on watershed in greatest need, and approximately 30,000 acres of wetland and riparian habitat would be treated annually using all treatment methods. Collaborative efforts by the BLM, Forest Service, other federal, state, tribal, and local land management agencies, and private conservation groups will slow or stop the decline in wetland acreage. Restoring natural fire regimes and native vegetation, and controlling weeds and other invasive vegetation, would improve wetland and riparian habitat and function, with greatest benefits likely to occur under the Preferred Alternative. Use of new herbicides proposed for use by the BLM would further reduce risks to wetland and riparian areas from the use of herbicides. Alternative C would ensure that wetland and riparian areas were not impacted by herbicides, but aquatic weed control could be difficult under this alternative as herbicides are the most effective treatment methods for controlling some aquatic plants. It is unlikely that there would be an irreversible or irretrievable commitment of resources under all alternatives.				
EFFECTS ON VEGETATION				
The nature of impacts to vegetation would be similar to impacts that have occurred in the past, as the BLM would continue to treat about 305,000 acres annually. Negative impacts to vegetation (i.e., harm to non-target vegetation) would be less under this alternative than under the other herbicide treatment alternatives, as would long-term positive benefits on vegetation and improvement in ecosystems. Since the BLM would not be able to use proposed herbicides, risks to non-target plants could be greatest under this alternative. Treatments would not be allowed in Alaska, Nebraska, and Texas. Risks to special status species	The most extensive impacts (both negative and positive) to vegetation would occur under this alternative. The BLM would be able to use four proposed herbicides that pose less risk to non-target plants than herbicides currently used. The BLM could also be able to use new herbicides in the future, which could reduce risks to non-target plants and provide greater ecosystem benefits. Risks to special status species would be greatest under this alternative. Use of proposed herbicides and new herbicides in the future should reduce the risk to special status species from treatments. Ecosystem benefits to special status species from	Non-target plants would not be affected by herbicides, but effects to vegetation would result from other treatment methods. Positive ecosystem benefits from vegetation management would be least under this alternative, as there are certain invasive and weedy species for which herbicide use is the only effective method of treatment or for which other methods are impractical. Under this alternative, invasive plant populations would likely continue to spread, possibly at increased rates. There would be no risks to special status species from use of herbicides under this alternative, although ecosystem benefits to special status species	This alternative would substantially reduce the risk of off-site drift to non-target vegetation, and impacts to non-target vegetation could be least under this alternative. Similar to the Preferred Alternative, there would be benefits associated with increased availability of new and future herbicides. However, the BLM might not be able to treat large and remote areas using ground treatment methods, increasing the likelihood that noxious weeds and other invasive species would spread in these areas. Fire and mechanical treatments would be substituted in some of these areas, but might not be as effective in areas with	Per treatment impacts to non-target vegetation from herbicide use could be least under this alternative because ALS-inhibiting herbicides would not be used. Several studies have shown that drift of ALS-inhibiting herbicides can have adverse effects on crops found near treatment areas. Focus on passive treatments and avoidance of herbicide use in riparian conservation and important cultural areas could provide benefits to these areas, except where aggressive weeds would only be controlled by ALS-inhibiting herbicides. Treatments would be allowed in Alaska, Nebraska, and Texas, although

TABLE 2-10 (Cont.)
Summary and Comparison of Effects on Resources by Alternative

No Action Alternative	Preferred Alternative	Alternative C	Alternative D	Alternative E
would be less under this alternative than under the other treatment alternatives because fewer acres would be treated.	vegetation treatments would be greatest under this alternative. The BLM would be able to treat vegetation in Alaska, Nebraska, and Texas using herbicides, although no treatments are currently planned for Alaska or Nebraska.	from herbicide treatments would be least under this alternative.	insufficient fuel to carry fires, or where sprouting species increased after mechanical treatments. Treatments would also be allowed in Alaska, Nebraska, and Texas, although use of herbicides in Alaska is unlikely. Based on acres treated, special status species would be less likely to be exposed to herbicides than under the Preferred Alternative. special status species would not be exposed to herbicides from off-site drift. However, ecosystem benefits to special status species from aerial treatments, especially in remote areas and large areas with invasive vegetation would be less than under the Preferred Alternative. The BLM would be able to treat vegetation in Alaska, Nebraska, and Texas using herbicides, although no treatments are currently planned for Alaska or Nebraska.	use of herbicides in Alaska is unlikely. Increased emphasis on passive restoration could benefit some special status species. Risks to special status species may be greater from using non-ALS-inhibiting herbicides than from using ALS-inhibiting herbicides. The BLM would be able to treat vegetation in Alaska, Nebraska, and Texas using herbicides, although no treatments are currently planned for Alaska or Nebraska.
Cumulative Effects: Human-caused effects to vegetation began when man first arrived in North America, nearly 12,000 years ago, but intensified in the western U.S. during the past 150 years as a result of modern human influences such as commodity extraction and urbanization. Fire suppression led to altered fire regimes and ecosystem degradation that has resulted in high severity fires and the spread of noxious weeds and other invasive vegetation during the past few decades. Many forest areas have become dominated by mid-seral shade-tolerant species, woodlands have invaded grasslands, and some native grasslands and shrublands have been invaded by annual weeds. Only 34% of public land was considered to be in good to excellent condition in 1986. Treatments to reduce hazardous fuel levels, control the spread of weeds, and restore native vegetation should improve ecosystem health over much of the West. Treatments would be focused in degraded watersheds and in the Temperate Desert Ecoregion to benefit sagebrush and other evergreen shrubland species. Based on modeling, treatments should slow land degradation and increase the number of acres of vegetation that are resilient to risks from fires, insects, and disease. All treatments would benefit vegetation, but the Preferred Alternative would convey the greatest benefits as more acres would be treated under that alternative than the other alternatives. Treatments would kill target and non-target species, and would return some areas to an early successional stage. Native plant production that was lost from treatments could not be retrieved, but treatments should result in improved native plant communities and improved ecosystem health in the long term.				
EFFECTS ON FISH AND OTHER AQUATIC ORGANISMS				
Potential benefits and risks of using herbicides would be lower than under the other herbicide treatment alternatives. Approximately 2,300 acres of habitat for aquatic organisms	Potential benefits and risks of using herbicides would be greatest. Approximately 10,000 acres of habitat for aquatic organisms could be treated. The BLM would be able to use four	Possible ecosystem benefits include the elimination of risks associated with accidental spills, drift, and persistence of herbicides. However, the risk of noxious weeds and invasive	Risk of herbicide drift, in terms of reducing off-site contamination of habitat for aquatic organisms, would be lower under this alternative than under the other treatment alternatives (although	Disallowing use of ALS-inhibiting herbicides would have limited benefits fish and other aquatic organisms, as ALS-inhibiting herbicides pose few risks to aquatic organisms.

TABLE 2-10 (Cont.)
Summary and Comparison of Effects on Resources by Alternative

No Action Alternative	Preferred Alternative	Alternative C	Alternative D	Alternative E
could be treated. The BLM would not be able to use four herbicides proposed for use that are more effective in treating vegetation in or near wetland and riparian areas and that have ecological risks to aquatic organisms similar to or lower than those associated with herbicides currently available for use by the BLM.	herbicides proposed for use that are more effective in treating vegetation in or near wetland and riparian areas and that have ecological risks to aquatic organisms similar to or lower than those associated with herbicides currently available for use by the BLM. The BLM would be able to use new herbicides in the future that may be even more effective and safer than currently-available herbicides. The BLM would be able to treat unwanted wetland and riparian vegetation in Alaska, Nebraska, and Texas to the benefit of aquatic organisms found on public lands in these states.	vegetation spreading in riparian and wetland areas would be greatest, especially for plant species that cannot be effectively controlled using other treatment methods. It also could be more difficult for the BLM to effectively treat unwanted vegetation in remote riparian and wetland areas.	differences would be small because few acres [< 2%] would be treated by air under alternatives A, B, and E). However, control of unwanted upland vegetation over large and/or remote areas would be difficult, limiting benefits to watersheds that could improve downslope wetland and riparian areas. Risk of herbicide drift from aerial applications affecting riparian and wetland vegetation and aquatic organisms would be lowest under this alternative. The BLM would be able to treat unwanted wetland and riparian vegetation in Alaska, Nebraska, and Texas to the benefit of aquatic organisms found on public lands in these states.	Passive treatments and limits on the use of livestock and OHV activity (within the limitations of the FLPMA) could benefit riparian and wetland areas used by aquatic organisms. Restrictions on the use of herbicides in riparian conservation areas could benefit aquatic organisms found in these areas, unless noxious weeds or other invasive vegetation could not be effectively controlled using other treatment methods. The BLM would be able to treat unwanted wetland and riparian vegetation in Alaska, Nebraska, and Texas, to the benefit of fish and aquatic organisms found on public lands in these states.
Cumulative Effects: Human-related activities, including urbanization, building of dams, conversion of wetlands to other land types, fire exclusion, agriculture, and construction of roads have had a profound impact on populations and habitats of fish and other aquatic organism in the western U.S. Fire suppression has led to degraded riparian habitats, while the spread of weeds and other invasive vegetation have clogged waterways, and degraded upland and riparian habitats that has led to erosion and degradation of water quality in habitats used by these organisms. Efforts to restore natural fire regimes and control the spread of invasive vegetation should benefit aquatic habitat. Treatments would be focused in the most degraded watershed subbasins. However, benefits may be greater for resident fish than fish that migrate off of public lands (e.g., anadromous fish), as the BLM would not have control over factors that could harm migratory fish off of public lands. Adverse and beneficial effects of using herbicides would be greatest under the Preferred Alternative; effects of other treatment methods would be similar among all action alternatives. Herbicides would not be used under Alternative C; thus, the BLM's ability to control aquatic weeds would be limited. Treatments could adversely affect the health and survivorship of aquatic organisms, and indirectly impact these organisms through impacts to habitat. New herbicides proposed for use should improve treatment success while having minimal impacts to aquatic organisms. Fish harmed or killed, and short-term productivity lost, from treatment would be irreversible. However, treatments should restore habitat function and populations should recover following treatment.				
EFFECTS ON WILDLIFE				
Beneficial and adverse impacts to wildlife would be less under this alternative than under the other herbicide treatment alternatives. The nature of wildlife impacts would be similar to those during the past 10 years. The BLM would not be able to use four new herbicides that pose fewer risks to wildlife than many currently-	Beneficial and adverse impacts to wildlife would be greatest under this alternative. Approximately 2 times more vegetation would be treated specifically to benefit wildlife than under the No Action Alternative. New herbicides proposed for use are less toxic to wildlife than many currently available herbicides, although	Wildlife would not be affected by herbicide use. Benefits to wildlife habitat could be lowest under this alternative, as there are certain invasive species for which herbicide use is the only effective method of treatment, especially in remote areas, areas with limited fuel to carry a fire, and in shrublands where mechanical	There would be fewer impacts to wildlife due to off-site drift than under the other herbicide treatment alternatives. Wildlife may be unable to avoid contact with herbicides, especially in areas typically treated using aircraft. However, long-term negative impacts on wildlife habitat and ecosystems could be	Elimination of the use of ALS-inhibiting herbicides would provide few benefits, if any, to wildlife, including special status species, and could result in more harm to wildlife if more toxic herbicides that are currently available to the BLM were used in their place. Other management practices proposed under this

TABLE 2-10 (Cont.)
Summary and Comparison of Effects on Resources by Alternative

No Action Alternative	Preferred Alternative	Alternative C	Alternative D	Alternative E
available herbicides. The BLM would be unable to use herbicides to treat unwanted vegetation in Alaska, Nebraska, and Texas, to the benefit of wildlife.	diquat and fluridone pose some risks to amphibians. Future herbicides should also be less toxic, allowing managers to reduce the overall risk to wildlife from herbicide treatments. Over 70% of all treatments would occur in the Temperate Desert Ecoregion, a much higher percentage than under the No Action Alternative, to benefit sage-grouse and other species using evergreen shrublands. The BLM would be able to use herbicides to treat wildlife habitat in Alaska, Nebraska, and Texas.	treatments are not effective in controlling shrubs.	greatest under this alternative, especially in remote areas that could not be effectively treated using fire (due to lack of fuels) or other treatment methods (primarily due to cost or lack of effectiveness). The BLM would be able to use herbicides to treat wildlife habitat in Alaska, Nebraska, and Texas.	alternative, including limitations on the use of broadcast applications in some riparian areas, especially those used by amphibians, could reduce short-term impacts to wildlife. The BLM would be able to use herbicides to treat wildlife habitat in Alaska, Nebraska, and Texas.
Cumulative Effects: Human activities associated with commodity extraction , agriculture, and urbanization, and more recently with large-scale, catastrophic wildfire, have resulted in the loss of wildlife and impacts to their habitats. Livestock and wild horses and burros can compete with native herbivores for food. Timber management has led to tree stands dominated by early- to mid-seral, shade tolerant species to the detriment of wildlife that need old-growth forests. Fire suppression has modified forest habitats and favored the encroachment of woodlands into grassland habitats, while intensive, short-cycle fires have promoted weed establishment and spread. Human activities have fragmented the landscape and hindered the movement and habitat use of wildlife, and have placed species with narrow habitat requirements and limited mobility at great risk. Proposed vegetation treatments would slow or reverse many of these adverse effects to wildlife habitat. Habitat loss would continue, especially off public lands. Modification of habitats due to fire suppression and spread of weeds and other invasive vegetation would be slowed on public lands. Some treatments would be designed to restore large areas of land and reduce habitat fragmentation, while most treatments would strive to create a mosaic of habitats to benefit a diversity of wildlife species. Greatest adverse impacts and benefits from treatments would occur under the Preferred Alternative. Risks to wildlife would not occur under Alternative C, and would be less under the other treatment alternatives than under the Preferred Alternative. However, herbicides may be needed to control vegetation that is not readily controlled using other treatment methods; use of proposed and new herbicides in the future would reduce health risks to wildlife from current levels. All treatments could kill or harm wildlife and adversely impact their habitats, but short-term impacts would be offset by long-term gains in number of acres revegetated using native vegetation and in improvement to ecosystem health. Loss of individual animals would be irretrievable, but treatments should restore habitat function and populations would be expected to improve in the long term.				
EFFECTS ON LIVESTOCK				
Beneficial and adverse impacts to livestock would be less than under the other herbicide treatment alternatives. The nature of livestock impacts would be similar to those during the past 10 years. The BLM would not be able to use four new herbicides that pose fewer risks to livestock than many currently-available herbicides. The BLM would be unable to use herbicides to treat	Beneficial and adverse impacts to livestock would be greatest under this alternative. Approximately 3 times more vegetation would be treated to specifically benefit livestock than under the No Action Alternative. Three of the four new herbicides proposed for use are less toxic to livestock than currently available herbicides. The BLM's ability to use new herbicides in the future should	Livestock would not be affected by herbicide use. Positive livestock habitat benefits could be lowest under this alternative, as there are certain invasive species for which herbicide use is the only effective method of treatment, especially in remote areas, areas with limited fuel to carry a fire, and in shrublands where mechanical treatments are not effective in controlling shrubs.	There would be fewer impacts to livestock due to off-site drift than under the other herbicide treatment alternatives. Long-term negative impacts on livestock forage could be greater under this alternative than under other treatment alternatives, especially in remote areas that could not be effectively treated using fire (due to lack of fuels) or other treatment methods (due to cost or lack of	Elimination of the use of ALS-inhibiting herbicides would provide few benefits, if any, to livestock, and could result in more harm to livestock if more toxic herbicides that are currently available to the BLM were used in their place. Other management practices proposed under this alternative, including limitations on the use of broadcast applications in some riparian

TABLE 2-10 (Cont.)
Summary and Comparison of Effects on Resources by Alternative

No Action Alternative	Preferred Alternative	Alternative C	Alternative D	Alternative E
unwanted vegetation in Nebraska, Texas, and Alaska.	further reduce the risks to livestock from the use of herbicides. The BLM would be able to use herbicides in Texas, Nebraska, and Alaska, to the benefit of any livestock that are found on public lands in those areas.	Herbicides, which are effective in the treatment of noxious weeds and other invasive plants that are toxic to livestock, would be unavailable.	effectiveness). The BLM would be able to use herbicides in Texas, Nebraska, and Alaska, to the benefit of any livestock that are found on public lands in those areas.	areas, could reduce short-term impacts to livestock. The BLM would be able to treat rangeland in Alaska, Nebraska, and Texas.
Cumulative Effects: Commodity extraction, agriculture, and urbanization are some of many human-related factors that have adversely impacted lands used by livestock. Altered fire regimes have led to large and severe fires, facilitated the spread of noxious weeds and other invasive vegetation, and have removed forage and degraded rangelands used by livestock in the West. Treatments would restore native vegetation and desirable non-native vegetation favored by livestock and make rangelands more resilient to disturbance. Adverse impacts and improvements to rangeland would be greatest under the Preferred Alternative. Risk of herbicide drift impacting livestock on and off public lands would be least under alternatives D and E. New herbicides proposed for use by the BLM, in particular imazapic, would improve rangelands while having minimal impacts to livestock. Treatments could kill or harm livestock and damage vegetation used by livestock for forage and cover. Long-term treatments would benefit livestock and slow or reverse rangeland degradation.				
EFFECTS ON WILD HORSES AND BURROS				
Beneficial and adverse impacts to wild horses and burros would be less than under the other herbicide treatment alternatives. The nature of wild horse and burro impacts would be similar to those during the past 10 years. Only 26% of treatments would occur in states where most (75%) wild horses and burros occur. Also, treatments in these states would mostly occur in evergreen shrublands, habitats that are not as important to wild horses and burros as grasslands, limiting risks to these animals. The BLM would not be able to use four new herbicides that pose fewer risks to wild horses and burros than many currently-available herbicides.	Beneficial and adverse impacts to wild horses and burros would be greatest under this alternative. Approximately 3 times more vegetation would be treated to specifically benefit wild horses and burros than under the No Action Alternative. Forty percent of treatments would occur in states where most (75%) wild horses and burros occur. However, as with the No Action Alternative, treatments in these states would mostly occur in evergreen shrublands, habitats that are not as important to wild horses and burros as grasslands, limiting risks to these animals. Three of the four new herbicides proposed for use are less toxic to wild horses and burros than currently available herbicides. The BLM's ability to use new herbicides in the future should further reduce the risks to wild horses and burros from the use of herbicides.	Wild horses and burros would not be affected by herbicide use. Benefits to wild horses and burros rangeland could be lowest under this alternative, as there are certain invasive species for which herbicide use is the only effective method of treatment, especially in remote areas, areas with limited fuel to carry a fire, and in shrublands where mechanical treatments are not effective in controlling shrubs. Herbicides, which are effective in the treatment of noxious weeds and other invasive plants that are toxic to wild horses and burros, would be unavailable.	There would be fewer impacts to wild horses and burros due to drift than under the other herbicide treatment alternatives. Long-term negative impacts on wild horses and burros forage could be greater under this alternative, especially in remote areas that could not be effectively treated using fire (due to lack of fuels) or other treatment methods (primarily due to cost or lack of effectiveness).	Elimination of the use of ALS-inhibiting herbicides would provide few benefits, if any, to wild horses and burros, and could result in more harm to wild horses and burros if more toxic herbicides that are currently available to the BLM were used in their place. Other management practices proposed under this alternative, including limitations on the use of broadcast applications in some riparian areas, could reduce short-term impacts to wild horses and burros.

TABLE 2-10 (Cont.)
Summary and Comparison of Effects on Resources by Alternative

No Action Alternative	Preferred Alternative	Alternative C	Alternative D	Alternative E
Cumulative Impacts: Wild horses and burros are protected under the Wild Free-roaming Horses and Burros Act of 1971. By the 1800s, more than 2 million animals were found in the western U.S., but by the 1950s, numbers were less than 20,000. As with livestock, human-caused factors have degraded rangelands used by wild horses and burros. These animals have also contributed to rangeland degradation. About 37,000 animals are found in the West, but the number of wild horses and burros the habitat can support is probably closer to 25,000. Efforts to better match wild horse and burro numbers to rangeland conditions should help to improve conditions for these animals. Treatments would restore native vegetation favored by wild horses and burros and make rangelands more resilient to disturbance. Adverse impacts and improvements to rangeland would be greatest under the Preferred Alternative. Risk of herbicide drift impacting wild horses and burros would be least under alternatives D and E. New herbicides proposed for use by the BLM, in particular imazapic, would improve rangelands while having minimal impacts to these animals. Treatments could kill or harm wild horses and burros and damage vegetation used by wild horses and burros for forage and cover. Over the long-term, treatments would benefit wild horses and burros and slow or reverse rangeland degradation.				
EFFECTS ON PALEONTOLOGICAL AND CULTURAL RESOURCES				
The risks to paleontological and cultural resources and health of Native Americans and other human receptors would be lower than under the other herbicide treatment alternatives. Fewer acres would be treated to control weeds and poisonous plants that could adversely affect humans, and that could displace native vegetation desirable to Native peoples' lifeway uses. This alternative would be least affective among herbicide treatment alternatives in reducing hazardous fuels, perhaps leading to greater incidence of wildfire and loss of paleontological and cultural resources, and Native people's life and property.	The risks to paleontological and cultural resources and health of Native Americans and other human receptors would be greatest under this alternative. However, benefits from reduction in noxious weeds and other invasive vegetation that are poisonous or displace vegetation used by Native Americans and Alaska Natives would also be greatest under this alternative. Herbicides could be used where paleontological and cultural resources were at risk from other treatment methods. Three of the four herbicides proposed for use are relatively harmless to Native peoples and other human receptors. The BLM would be able to treat vegetation in Alaska, Nebraska, and Texas using herbicides, which may benefit vegetation that provided lifeway values.	There would be no risks to paleontological and cultural resources and human health from herbicide applications. Native people's health might suffer if noxious weeds and poisonous plants that harm humans are not controlled in traditional lifeway and other use areas.	Human health risks from herbicide drift would likely be lower than under the other treatment alternatives. However, benefits to vegetation used by Native peoples for traditional lifeway uses and to habitats used by fish and game harvested by Native peoples would be less than under the other herbicide treatment alternatives, as treatments would be less likely to occur in remote areas and areas where there is insufficient fuel to carry a fire or it is too costly to treat vegetation using other treatment methods. The BLM would be able to treat vegetation in Alaska, Nebraska, and Texas using herbicides, which may benefit vegetation used for Native lifeway uses n these states.	The BLM would not be able to use ALS-inhibiting herbicides that have low risk to humans. The BLM would make additional effort to collaborate with Native American tribes and Alaska Native groups to protect and enhance culturally significant plants and other sites of cultural importance. Because fewer acres would be treated under this alternative, improvements in vegetation quality and reductions in populations of plant species that are harmful or poisonous to humans would not be as great as under the Preferred Alternative.

TABLE 2-10 (Cont.)
Summary and Comparison of Effects on Resources by Alternative

No Action Alternative	Preferred Alternative	Alternative C	Alternative D	Alternative E
Cumulative Effects: Most paleontological material is buried and thus has been minimally disturbed, except where these resources are near the surface. Vegetation treatment activities would have little impact on paleontological resources, and can even protect these resources by reducing erosion. Cultural resources were destroyed or taken by settlers and collectors; these losses slowed after passage of the National Historic Preservation Act and Archaeological Resources Protection Act. Treatments would have little effect on cultural resources, although vegetation and other traditional lifeway resources would be impacted. Risks to paleontological and cultural resources would be least under the No Action Alternative. Benefits to vegetation for traditional lifeway uses would be greatest under the Preferred Alternative. Treatments could result in unavoidable adverse effects, but the risks would be minor. Treatments would likely result in short-term loss of vegetation used for food, baskets, and other traditional lifeway uses. Over the long term, restoration of natural fire regimes and native vegetation, and control of weeds, should improve vegetation used for traditional lifeway activities. Loss of paleontological and cultural resources would be irretrievable. Vegetation used for traditional lifeway uses would be lost from treatments and human-caused activities, but over the long-term, treatments should slow or reverse this loss on public lands.				
EFFECTS ON VISUAL RESOURCES				
Adverse visual impacts associated with herbicide treatments would be similar to current impacts, and lower than under the other herbicide treatment alternatives. Improvements in the visual characteristics of landscapes would also be lower under this alternative than the other treatment alternatives.	Adverse visual impacts associated with herbicide treatments would be greatest under this alternative. Over the long term, this alternative should have the greatest positive impact on visual resources as natural vegetation communities and landscapes are restored. The BLM would be able to use herbicides to improve visual resources on lands in Alaska, Nebraska, and Texas.	Visual resources would not be impacted by herbicide treatments. However, there could be less improvement in the visual quality of the landscape over time if herbicides could not be used to treat invasive plants, or large areas were burned instead to remove unwanted vegetation.	Impacts to the visual resources would be less than under the Preferred Alternative, but greater than under the No Action Alternative. Areas that could not be effectively treated except by aerial applications of herbicides would not be treated. The BLM would be able to use herbicides to improve visual resources on lands in Alaska, Nebraska, and Texas.	Impacts to visual resources would be similar to those under Alternative D as broadcast treatments would be discouraged. ALS-inhibiting herbicides would not be used to control downy brome and other invasive vegetation to benefit visual resources. The BLM would be able to use herbicides to improve visual resources on lands in Alaska, Nebraska, and Texas.
Cumulative Effects: Some past human activities have modified the visual characteristics of public lands. In addition, large, severe wildfires, and in some situations the spread of weeds and other noxious and invasive vegetation have altered the landscape and made portions of the West less visually appealing. Proposed vegetation treatments would impact visual quality over the short term by killing vegetation and burning rangeland and forests, causing large areas to appear brown or black. Over the long term, the health and visual appearance of public lands should improve as degraded lands were revegetated with native vegetation and natural fire regimes were restored. Adverse impacts and benefits would be greatest under the Preferred Alternative. The risk of herbicide drift impacting the visual characteristics of non-public lands would be least under alternatives D and E. Treatments would have short-term impacts on visual characteristics in the treatment area, but visual qualities of the area should improve over the long-term. Impacts to the visual characteristics of the area could be reversed if native, more visually appealing vegetation was restored.				
EFFECTS ON WILDERNESS AND OTHER SPECIAL AREAS				
Fewer acres would be treated under this alternative than under the other herbicide treatment alternatives. Adverse impacts to wilderness and other special areas would be less, but benefits to ecosystem health would also be less under this alternative than under other herbicide treatment alternatives.	Adverse impacts, including temporary closures of wilderness areas, would be greatest under this alternative. Visitors could be displaced to other wilderness and recreation areas. Positive ecosystem benefits would also be greatest under this alternative and the BLM would be most likely to control noxious weeds and other invasive species in wilderness and other special areas under this	There would be no risks to wilderness and other special area users from accidental exposure to herbicides. However, weeds could spread more rapidly and infest more acres in wilderness and other special areas if herbicides could not be used.	Although aerial treatments in wilderness and other special areas would be uncommon under the other treatment alternatives, this alternative would ensure that the amount of area temporarily closed to wilderness and other special area visitors was kept small. However, aerial treatments could be completed more quickly and with fewer disturbances to solitude and other wilderness	An emphasis on ecosystem based management and on controlling weed populations outside of wilderness and other special areas before treating larger infestations in these areas could help to protect wilderness values. However, if weed infestations become established in wilderness and other special areas before they were controlled outside the area, they could spread rapidly

TABLE 2-10 (Cont.)
Summary and Comparison of Effects on Resources by Alternative

No Action Alternative	Preferred Alternative	Alternative C	Alternative D	Alternative E
	alternative. Risk to wilderness and other special area users from the new herbicides would be less than risks associated with most currently-available herbicides.		values than other treatment methods, including mechanical treatments and fire use.	and degrade the wilderness experience. The five herbicides that would not be allowed for use under this alternative are among the lowest risk herbicides that would be available to the BLM
Cumulative Effects: Wilderness and other special areas represent about 4% of lands in the U.S. and represent some of the last remaining wild conditions and natural landscapes in the country. Because of their small size (the average size of wilderness areas on public lands is 42,000 acres), most wilderness areas are ecological “islands.” Thus, a large, severe fire or weed infestation can substantially alter the characteristics of wilderness. Treatments to restore natural fire regimes and ecosystem health should benefit wilderness and other special areas. Although few treatments are proposed for these special areas, treatments near special areas would reduce the risk of weeds and catastrophic fire impacting special areas. Short-term impacts and long-term benefits from treatments would be greatest under the Preferred Alternative. Mechanical treatments would be limited under all alternatives. Under Alternative E, treatment of weeds in special areas could not occur until weed threats near special areas were halted, potentially increasing the risk of weed spread within wilderness and other special areas. Treatments could adversely impact the “unspoiled” nature of wilderness over the short term, but effects would begin to disappear within 1 to 2 growing seasons, and special area ecosystems would benefit over the long term.				
EFFECTS ON RECREATION				
Fewer acres would be treated than under the other treatment alternatives. Thus, adverse effects to recreation, including temporary site closures, decline in scenic appeal of recreation sites, and potential human and wildlife health effects, would be less than under the other treatment alternatives. However, benefits to recreation from treatments, including control of thorny and poisonous plants, restoration of degraded areas to a more natural condition, and reduced risk of catastrophic fires, would also be less. The BLM would not be able to use herbicides to treat recreation sites in Alaska, Nebraska, and Texas.	Effects to recreation would be greatest under this alternative. It is likely that there would be more temporary site closures and loss of recreation opportunities, including plant collecting, sightseeing, hiking, horseback riding, fishing, and hunting, than under the other treatment alternatives. Risks to humans, fish, and wildlife from currently-available herbicides would greatest based on the number of acres treated. However, new herbicides with lower risks to humans, fish, and wildlife than most currently-available herbicides could reduce overall risk from use of herbicides on recreation areas. The BLM would be able to use herbicides in Alaska, Nebraska, and Texas to benefit recreation sites, although the BLM presently does not have plans to use herbicides in Alaska.	There would be no risks to wilderness and other special area users from accidental exposure to herbicides. However, there are certain plants that could be injurious to humans, which are most easily controlled by herbicides (e.g., sprouting plants such as poison oak). An increase in populations of these weeds could discourage recreational use of infested areas.	Similar to the other treatment alternatives, it is unlikely that aerial spraying would be used in high public use recreation areas. However, aerial spraying would also be limited in more remote areas. Thus, the number of acres temporarily closed due to herbicide treatments would be less than under the other treatment alternatives.	An emphasis on passive restoration, ecosystem-based management techniques, greater reliance on spot versus broadcast treatments, and limits on use of herbicides in riparian areas would result in fewer effects to recreation areas and users as compared to other treatment alternatives. Because fewer acres would be treated, especially in areas where broadcast treatments would typically occur, restoration of natural vegetation might not occur, or might be more difficult or costly in these areas. The BLM would not be able to use ALS-inhibiting herbicides under this alternative. These herbicides tend to have lower risk to humans, fish, and wildlife than other herbicides that are currently-available or proposed for use.

TABLE 2-10 (Cont.)
Summary and Comparison of Effects on Resources by Alternative

No Action Alternative	Preferred Alternative	Alternative C	Alternative D	Alternative E
Cumulative Effects: Recreation resources were of minor importance to the BLM until the 1950s. Natural resource commodity extraction, effects of fire suppression, and spread of weeds have adversely impacted recreational opportunities on public lands. Vegetation treatments would add to this cumulative loss by reducing recreation opportunities in treatment areas over the short term. Over the long term, vegetation management should increase recreational opportunities, including those involving wildlife viewing, hunting, hiking, and water sports. The greatest adverse impacts and benefits would occur under the Preferred Alternative. Loss of recreational opportunities would not be avoided during some treatments, especially in areas that required closure to protect the health and safety of visitors. Long-term improvement in ecosystem health should increase the number and quality of recreational opportunities and reduce the likelihood of large, severe fires and weed infestations making large tracts of public land unsuitable for recreation. Closure of facilities and restrictions on access as a result of treatments would result in irretrievable loss of recreational opportunities during the period of the closure or other restrictions, but those opportunities would be restored following completion of the treatment. The risk of future losses would be lessened over the long term as ecosystem health improved on public lands.				
EFFECTS ON SOCIAL AND ECONOMIC VALUES				
Social and economic benefits and impacts from herbicide treatments would be similar to what has occurred during the past several years. Approximately $30 million would be spent on herbicide treatments, or about $100 per acre. There would be little noticeable overall change in population, employment, and income on a regional scale, although small communities near larger treatment areas could benefit. Overall risks to minority populations and children would be less under this alternative than under the other treatment alternatives because fewer acres would be treated. However, risks per acre could be greater because the BLM would not be able to use new herbicides in the future that may have less health risk than currently-available herbicides, including the four herbicides evaluated in this PEIS. Long-term wildland fire cost savings and benefits from restoration of natural vegetation and ecosystems would be least under this alternative.	Social and economic benefits and impacts from herbicide treatments would be greatest under this alternative. Approximately $89 million would be spent on herbicide treatments, or about $95 per acre. There would be little noticeable overall change in population, employment, and income on a regional scale, although small communities near larger treatment areas could benefit, and increases in population, employment, and income, although short-term and localized, would be greatest under this alternative. Overall risks to minority populations and children would be greatest under this alternative. However, risks per acre could be less than under the other treatment alternatives because the BLM would be able to use new herbicides in the future that may have less health risk than currently-available herbicides, including the four herbicides evaluated in this PEIS. Long-term wildland fire cost savings and benefits from restoration of natural vegetation and ecosystems would be greatest under this alternative.	There would be no social and economic benefits from herbicide treatments under this alternative. There would be no change in population, employment, and income on a regional scale from herbicide treatments, but increases in these factors could result from use of other treatment methods. There would be no risks to minority populations and children from herbicides. Long-term wildland fire cost savings and benefits from restoration of natural vegetation and ecosystems would be less under this alternative than the other treatment alternatives, especially in areas where other treatment methods would be less effective than herbicide treatment methods.	Economic benefits and impacts from herbicide treatments would be less than for the Preferred Alternative, but greater than for the other treatment alternatives. Approximately $77 million would be spent on herbicide treatments, or about $145 per acre. There would be little noticeable overall change in population, employment, and income on a regional scale, although small communities could benefit. Overall risks to minority populations and children would be similar to the No Action Alternative and less than the other treatment alternatives because 1) fewer acres would be treated than under the Preferred Alternative; 2) the BLM would be able to use newer herbicides with less health risks than currently-available herbicides, an improvement over the No Action Alternative and Alternative E; and 3) the risk of herbicide drift impacting humans would be less under this alternative than the other treatment alternatives. Long-term wildland fire cost savings and benefits from restoration of natural vegetation and ecosystems	Approximately $60 million would be spent on herbicide treatments, or about $128 per acre. There would be little noticeable overall change in population, employment, and income on a regional scale, although small communities near larger treatment areas could benefit. Overall risks to minority populations and children would be similar to the other herbicide-treatment alternatives. This alternative would clearly establish protection for Native Americans and Alaska Natives, but would also discourage use of ALS-inhibiting herbicides which tend to have less health risk than non-ALS-inhibiting herbicides. Long-term wildland fire cost savings and benefits from restoration of natural vegetation and ecosystems would be less than under the Preferred Alternative, similar to that of Alternative D, and greater than that of the No Action Alternative. An objective of this alternative is to restore native ecosystems and use passive treatments, where feasible. However, the BLM would have limited ability to conduct

TABLE 2-10 (Cont.)
Summary and Comparison of Effects on Resources by Alternative

<table>
<tr><th>No Action Alternative</th><th>Preferred Alternative</th><th>Alternative C</th><th>Alternative D</th><th>Alternative E</th></tr>
<tr><td></td><td></td><td></td><td>would be less than under the Preferred Alternative, and similar to that under the other treatment alternatives.</td><td>broadcast treatments, limiting the size of areas that could be effectively treated, especially if fire use would be ineffective to treat these areas. The BLM would also not be able to use imazapic and other ALS-inhibiting herbicides that have shown effectiveness in controlling downy brome and other noxious weeds and invasive species.</td></tr>
<tr><td colspan="5">Cumulative Effects: Population growth rates in the West have exceeded those of the rest of the U.S. for several decades, with growth greatest in communities associated with the WUI. Agricultural, forestry, mining, fishing, and service jobs are important and closely tied with actions on public lands. Revenues derived from public lands have fluctuated with national and global needs and public policies, but in general, revenues provided to the BLM from mining and oil and gas development have increased, while timber harvesting and grazing revenues have declined. Expenditures by the BLM to state and local governments have doubled in the past 10 years, with the largest increases in states with active mining and oil and gas operations. Future high growth rates are expected, including those of minority populations that could potentially suffer greater impacts from treatments than in the past. Employment and income will continue to be tied to the global economy, with mining and oil and gas exploration and development increasing, and timber harvesting and grazing declining. However, timber-related jobs could increase in the short term as timber is removed to reduce hazardous fuels on BLM- and Forest Service-administered lands. Revenues to the federal government will reflect these trends. Costs to the federal government for fire suppression and restoration of historical fire regimes and ecosystem health would exceed $1.6 billion annually and would likely increase over time. Costs for vegetation treatments on public lands are estimated at $1.1 billion annually. Treatments could have adverse effects on local industries and communities, but long-term gains in ecosystem health should benefit communities and many resource-based industries. Treatments would require a substantial financial commitment by the federal government and would not be retrievable once spent.</td></tr>
<tr><td colspan="5">EFFECTS ON HUMAN HEALTH AND SAFETY</td></tr>
<tr><td>Risk to occupational and public receptors would be lower than under other herbicide treatment alternatives. The risk to humans per application could be greater than under the other treatment alternatives, however, because the BLM would not be able to use new herbicides proposed for this PEIS, nor herbicides developed in the future, that likely would have fewer risks to humans than currently-available herbicides. In addition, the BLM would be able to use six herbicides that would not be allowed under the other herbicide treatment alternatives—2,4-DP, asulam, atrazine, fosamine, mefluidide,</td><td>This alternative would likely result in the most overall risk to human health of all alternatives because of the large number of acres treated. The BLM would be able to use new herbicides that have lower health risks than currently-available herbicides. This alternative would also be most effective in treating noxious weeds and poisonous plants that adversely affect humans.</td><td>Alternative C would not result in human health risk from herbicide applications. However, human health could be adversely affected if noxious weeds and poisonous plants that are harmful to humans increased in occurrence under this alternative.</td><td>Human health risks per application area could be lower than for other herbicide treatment alternatives because herbicides would not drift as far. Overall risks would be lower than under the Preferred Alternative because fewer acres would be treated. Health of users of more remote public lands might be adversely affected if noxious weeds and poisonous plants that are harmful to humans increased in occurrence in these areas under this alternative due to the inability of the BLM to treat them using aircraft.</td><td>The BLM would not be able to use ALS-inhibiting herbicides that have low risk to humans. However, this alternative favors spot over broadcast treatments, encourages additional protection of cultural resource and other areas used by Native Americans and Alaska Natives, and would treat fewer acres, thus presenting fewer risks to humans as compared to the Preferred Alternative. Health of users of more remote public lands might be adversely affected if noxious weeds and poisonous plants that are harmful to humans increased in occurrence in these areas due to the inability of the BLM to treat</td></tr>
</table>

TABLE 2-10 (Cont.)
Summary and Comparison of Effects on Resources by Alternative

No Action Alternative	Preferred Alternative	Alternative C	Alternative D	Alternative E
and simazine—herbicides that have greater risk to humans than other currently-available or proposed herbicides.				them using aircraft and other broadcast-treatment methods.
Cumulative Impacts: Risks to health from occupational injury or death, from cancer, and from exposure to pollutants has generally declined during the past few decades. However, risk from wildfire in recent years has held steady or increased as more people have moved into the WUI and the number and severity of wildfires has increased. Proposed vegetation treatments pose risks to worker and public health. Injuries and death could result from use of equipment, fire, and herbicides to treat vegetation, but the risk is very small to negligible. Treatments would minimize human exposure to smoke by scheduling prescribed burns when meteorological conditions are favorable for smoke dispersion. Risk from wildfire would hold steady or be reduced over time as levels of hazardous fuels and risk of wildfire in WUI areas were reduced. Risk of exposure to herbicides would increase under alternatives B, D, and E, although the BLM proposes to use new herbicides that pose less human health risk than most currently-available herbicides. Alternative E places greater emphasis on hazardous fuels treatments in the WUI and development of defensible spaces near structures, which would reduce risk to human life from wildfire. There would be risks to human health from vegetation treatments, but long-term improvement in ecosystem health and use of less toxic herbicides have the potential to reduce these risks.				